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Notes of

Lectures

upon

Chemistry

By

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taken by

Benjamin Rush

Of the Nitrous Acid.

Nitrous Acid is only found in Common Nitre, and Nitrous Ammoniac, and it is extremely probable that it is never found in a Separate State, but in Consequence of the Putrefaction of Animal & Vegita- =ble Substances only. The common Notion of it is the upper Stratum or Soil of the Ground, as far down as the Roots of Vegitables reach. But as the Acid of Nitre is Obtained from Subjects always in Com- =bination w: Alkali we shall forbear saying any more concerning its Producti- =on till we treat of Neutral Salts. J

shall therefore confine myself at present to
the means by which we may extricate
it from Bodies in which it is present, &
its different Properties when extricated.
It may be extracted from Chalk by Dis-
=tillation w:th the Addition of pure Clay
or brick Dust w:ch as we said before by
dividing the Aggregate prevent Fusion,
and favour the Resolution. — The Reason
assigned for the good Effects of Clay in
the preceding proposition is the true One,
nor does it act as some Chemists have sup-
=posed by the Vitriolic Acid present, since
w:th Pott Sand w:th the Distillation succeed
as well w:th a Bole perfectly freed from any

saline matter: but y^e troublesome Appear-
=rates, and great Heat required has occa-
=sioned this practice to be generally deserted,
and the more commodious Use of the
Addition of Vitriolic Acid Alone, or com-
=bined wth Iron in the Form of green Vitriol,
to be substituted in its Room. by this
means the Oil is disLodged by Oil from y^e
first Alkali, and must be immediately
dissipated before it can be combined w^th
the Iron or Earth if Vitriol or Alum are used.
The Iron or Earth if Vitriol or Alum are used.
Macquer gives all the necessary Directions
for this Process. I shall only remark the
erroneous Opinion of Some, Who direct y^e
Water should be added in the Distillation to

prevent the escape of fumes, for ye fumes of
Vitriol are more elastic than those of the
Acid. - This Practise is only fit for large
Works. The Distillation is performed
with less Heat, and more Convenience to
the Private Chemist when Vitriolic Acid
is used alone. The Nitre must first be re-
duced to powder. Some have advised this
to be done by means of Calcination,
that the Water contained in the Crystals
of the Nitre may be dissipated, but y^e
fumes of such calcined Acid are very diffi-
cultly managed. To this powder must be
added Vitriolic Acid, tho' ye proper portion
-tion remains still a Dispute. The general
Rule is to add one part of Vitriolic Acid to

two parts of Nitre. Dr. Lewis observes y: ~~How~~ w:
this proportion the Residuum is a Mass not
soluble in water, and therefore difficulty
cleansed from the Retort. The London College
directs three parts of Nitre to one of Oyl, by
this means we not only get ye Nitrous
Acid, but a Residuum which is a Vitriol:
& Tartar. But if we are not anxious to
preserve the Residuum I think the former
proportion may be employed as it more
entirely extricates the Nitrous Acid. When
we have prepared the Nitre it must be
put into a Retort, and the Lute ingeniously
fitted to be quite dry before we apply the
Fire. The Heat must be very gradually

encreased 'till the whole is in Fusion, & must be continued 'till Fumes ceases to rise. After the Process is finished we must suffer the Vessels to cool, before we open them, because they are filled w: uncon- densed Fumes for a long time after the Operation is over, w: would escape if they were not accurately closed; the sudden Ad- mission of Air also frequently breaks the distilling Vessels. The Nitrous Acid thus Obtained is usually mixed w: some Oil or w: rises in Distillation, and w: a portion of the Muriatic Acid proceding from y common Salt always present in Nitre, and decomposed also by the Vitriolic Acid. It

may be separated from the Vitriolic by Co=
=hobation, and from y^e Muriatic by a
Solution of Silver in Nitrous Acid to which
the former has the greatest Affinity. It is
a Test that when Nitrous Acid is in Conjunc=
=tion wth Vitriolic and Muriatic Acid. They may
be precipitated in form of White Clouds
by the Addition of a Solution of Silver. Thus
the Trouble of two Operations is prevented.

This Acid when concentrated sends out
reddish Fumes, and is of a light Orange
Colour. the Colour however varies accord^g
to the different Matters wth wch it is combined
in an impure State. Thus Distillatory^rs
Green Vitriol produce an Acid differing
from the ~~Green~~ orange Colour, and wth White

Vitriol a colorless Liquor. Mr Ruelle

After 5 Days Labour Obtained a Nitrous

Acid whose Specific Gravity was to that of

Water as 15 to 10. but when its Specific

Gravity is as 14 to 10 it is sufficiently

concentrated for any purpose I am

acquainted with. in this State we ought

to preserve it for use, since it is more

easy to dilute a concentrated Acid for

purposes wch require it, as the Solution

of Silver than to concentrate a dilute

Acid for the purposes wch require it in

Aqua Fortis. Such is the Inflamation

of Oils. This Acid when very dilute is of

a green Colour, wch may be entirely dis-

=charged by the Addition of pure Silver.

If the green Colour or any other take place
after the Addition of the Silver. we may
be certain that the Silver contains Copper
or some foreign matter adhering to it.
If Nitrous Acid is much diluted, & subjected
to Distillation, the Result will be an Acid
giving no Fumes.

Let us now consider its Relation
to other Bodies beginning w:th Saline.

It unites w:th the Saline producing
Effervescence & Heat. its union w:th the
Alkalies is attended w:th same Phænom.
-na as the Vitriolic. its power of Satura-
-tion and Attraction is considerably less,
and the Neutrals produced entirely different.
One Fig of fixt Alkali saturates 7/4 of Nitrous

Acid, whereas the same Quantity satu-
-rates only ℥v of Vitriolic.

It unites w: all Inflammables. gen-
-rating Heat and Effervescence, except w:
Sulphur with which it seems to fuse
all union. in the 6th Century it was
found y: a sudden Mixture of Oil &
Essential Oils produced actual Flame.
the Experiment was long neglected 'till
Dr. Hoffman revived it, and found y all
the distilled and most of the expressed Oils
might be inflamed by the Assistance of
Nitrous
Vitriolic Acid. from later Experiments
we are informed that all y Oils un-
-der a certain Management might

be inflamed by the Nitrous Acid alone.

It unites w: Alcohol producing a Spirit of Ether.

It unites w: all Metallic Bodies except Gold, and perhaps Platina. Tin & Antimony it only corrodes, but suspends the Action in a fluid Form.

It unites w: Absorbent Earths of every kind.

It unites w: water producing Heat, but w: Ice it produces Excessive Cold. we may produce a greater Artificial Cold by this kind than any Other Body.

It attracts Moisture from the Air. we are ignorant of its further Effects upon this Fluid.

It has the same Effects on the Vitriolic

bird upon Animal and Vegitable Diet:
= stances only in a less Degree.

When combind w: Alkalies or Metals
it deflagrates in Contact w: ye Fire.

Of the Muriatic Acid.

It is a Native Substance, & whether
it may not be produced by Art is much
to be doubted. It is always found either
combind into Common Salt, or common
Ammoniac. In the first of these every
Person will acknowledge it to be a Na=
=tural Substance, but as the common
Ammoniac is never found except in
Consequence of Inflammation, it has

been reckoned by some, & perhaps not
conjustly an Artificial Substance.

This Acid is chiefly distilled from Common
Salt as it is cheaper than Ammoniacy not
that there is any Difference in the Acid ob-
=tained from either Subject. the Distillation
must be performed by the addition of pure
Vitriolic Acid, or some of its Concretes with
Earth. we cannot employ crude Vitriolas
in the case of Nitre, because the Iron be-
=coming volatile from a particular power
which the Muriatic Acid exerts towards
Some Metals, will rise into y^e Receiver,
and intercept the process. it is as yet
disputed that this Acid renders Calcarious
Earths volatile. I think therefore that the

Vitriolic Acid should always be employed
in its Seperate State. a portion of this
Acid will inevitably rise in the Distillation,
but we may extricate it perfectly by the
Addition of Calcarious Earth w.h & Vitriolic is a
Acid Only corrodes, and will therefore
be Bride w.h it in the form of powder. we
must use very firm and accurate luting
giving them time to dry before the Ope:
-ration, Since the Fumes of this Acid
are scarcely to be confined by any Ma:
-nagement except by a large Addition
of water, which we cannot employ when
we require a very concentrated Acid. We
may determine when the Distillation is

sufficiently advanced by ℈ Effervescence
of deep yellow Fumes, and Air Bubbles on
the surface. its Specific Gravity however
is a more invariable Rule, which in its
purest State is to ℈ of water as 12 to 10.
In this State it is of a Gold Colour emitting
copious Fumes w: ℞ Nitric Acid when it is
very much diluted w: ℞ water. we shall
next mention its Affinity to ℈
After Classes of Bodies.

It unites w: ℞ all Saline Bodies w: ℞ the
same Phænomena as the Nitrous and
Vitriolic, and produces w: ℞ Alkali diff: ℈:
Neutrals. from this it may luckbelled
by either of the former Acids. ℥i of first
Alkali saturates ℥xxi of this Acid.

It does not unite wth Oils. This is proba-
: bly owing to the great Quantity of
Water it contains even in its most
concentrated State. it may be united
wth Alcohol tho' imperfectly to produce an
Ether. it has no Effect upon Sulphur.
It unites with all metallic Bodies,
except Gold. Copper - Iron - Zinc & Tin
it dissolves in a fluid Form. Quicksilver
& Antimony it does not readily dis:
-solve in the Cold. Lead Silver & Bism:
it Only corrodes.
It unites wth all Absorbent Earths
& Alkalies forming Salts in a fluid Form,
Whereas the Vitriolic Only corrodes them

— Fix. W: The Calcarious it forms a noted
Salt called Sal Ammoniac. The latter
of these names is taken from its being
Obtained by Distillation fix. W: of common
Ammoniac, and the former from its
Lixity, ch. W: is a property not applicable
to any of the other Ammoniacal
Salts.
It unites fix. W: water, and purifies Air like
the ~~Barytical Salts~~. Nitrous & Vitriolic Acid.
It dissolves Animal, and Vegitable
Bodies, both by not dissolving Oils it does
not change their Colour to black. on this
Acc: it is much employed by Anatomists
in making preparations of injected wax.

for when the acid is applied it entirely
dissolves the Flesh, and leaves ye wax in
the exact shape of the part injected.
we think it proper here to mention
a very peculiar Menstruum formed
of the Nitrous and Muriatic Acids viz:
from its power in dissolving ye Rex
Metallorum Gold has been called
Aqua Regia. It may be produced
by adding two parts of Nitrous to 1 of
Muriatic Acid or vice versa. This Diffe-
rence of proportions occasions no Change
in the Properties of the Mixture. it may
also be produced by adding one part of
common Salt to 4 parts of Nitrous Aci

It may also be obtained by adding Muria-
-tic Acid to Common Nitre. This will ap-
-pear a paradox to many according to
the Laws of Elective Attraction, but readily
accounts for it upon rational and
obvious principles. We observe y: 3 the
Practice will not succeed except in a
very considerable Heat, when a sufficie-
-ent Quantity of Nitrous Acid to form an
Regia Regia will be decompos'd & raised
w: the Muriatic. It acts upon most
Bodies nearly in the same manner as
the Acids which compose it, Only it is a
much more powerful Menstruum for
all Metals. We are naturally led hence to

enquire w: are the Effects of Vegetable Acids com-
=bined? It is to be conducted since we see
such remarkable Effects of their Combi-
=nation in dissolving and inflaming
Oils, that important Discoveries might
arise from such Inquiries.

Of Vegitable Acids

They are native Substances found uni-
=versally in Vegitables, and perhaps in
Vegitables only. Dr Boerhaave enu-
=merates 5 Kinds of this Acid, but
think they may very properly be
reduced to 3. viz: the native, the
Fermentive, and the Distilled.

Native Acid is Obtained from Vegetables as Lemons by simple Expression. In this State it is in very dilute, that if kept for any long time it would run into a Putre-
= factive Fermentation. This however may be obviated by Rectification, after which it is called Rob. The general Rule directs us to evaporate till the Substance is of the Consistence of a Syrrup. but the process cannot be extended so far, without chan-
= ging the peculiar Flavour of the Acid. We may remedy this by evaporating off the Water, and by the Addition of Alkohol which is extremely convenient not Only as an Antizymic to prevent Fermen-
= tation, but as it is always mingled in

Rob for the usual purposes of our
Economy.

Fermentive Acid.

We shall omit saying anything con-
=cerning the production of this Acid,
Till we treat of the general Theory of
Fermentation under the Head of
Alkohol. —

This Acid is always considerably diluted
2h
w: water. it may be rendered more con-
= centrated by Distillation, as directed in
Margaret: but this practise will not
sufficiently dispel the water without ge-
=ving the Acid such an Empireuma
as renders it unfit for any Oeconomi-
=cal

Uses. Another Method has been proposed
of combining the Acid w: a Metal in
form of a Salt, and then distilling from
the Crystals. but even if few Metals
can be combined w: the Vegitable Acid,
make this proposal of but little use. For
Example, if it is combined w: Lead into
a Saccharum Saturni, and subjected to a
Distillation, instead of a concentrated Acid.
we shall get an Ardent Spirit. Iron also
changes the Acid. Zinc will not dismiss
it without a great deal of Heat. when
combined with Oil per vinto ber Digris it
may be Obtained very much concen:
-trated, but then it cannot be used w:
Safety for Medicinal purposes. upon Acc:

of the deliterious Effects of the Copper or
Zinc, some of whose particles we cannot
-not prevent by any precaution from
rising w.th the Acid in Distillation.

After repeated Experiments we think
last Method to accomplish this Desideratum
of the Chemists is to expose the Vinegar to
Cold 8, or 10 Degrees below the freezing
point, carefully taking off the Pellicles
of Ice which form upon the Surface. The
Pellicles contain chiefly water. by this
Method I have reduced four pints to half
a pint, and in colder Climates it may
be practised w.th greater Advantage. The
Practice will not be successful when

the Cold does not descend to 22° or 12°
below the freezing point.

One Ounce of Vegitable fixt Alkali
saturates 7 oz of vinegar. this Combinā:
produces about two Ounces of Regenerated
Tartar, from which we may obtain in
Distillation a very concentrated Vegitable
Acid by the Addition of the Vitriolic.
the portion of the latter wch necessarily
arises in Distillation may be extricated
by Redistillation wth a fresh portion
of Vitriolic Acid.

Distilled Acid

Is obtained from the Distillation of
Vegitables Ale. the Tin contains

This Acid in great Abundance, and that
is generally employed in the following
Manner. The Retort is filled w.th 4th Chips
of the Fir, and a Sand Heat applied gra-
-dation. in the first part of the Distillat-
-ation. a watery ariose. after that an Acid — then
an Oil w.ch is the Essential Oil of the Fir, &
lastly an Empireumatic Oil resembling
Tar. These Oils being separated by the
means employed under the Head of Sepa
=ration, the Acid must be concentrated
by a second Distillation. This Acid is the
same Acid as that present in Tar wa
and contains all its Medical properties

Dr Berkly Bishop of Cloyne who is a
strong Advocate for the virtues of Tarwater
directs us to use Norway Tar rather
than American. The Cause of this prefe-
rence is not on Acc.t of any peculiar
Quality in the former, but from a Quanti-
ty of water w.ch the Norwegians Adulte-
rate. Whereas the Americans are allowed
a Bounty for the Importation of Tar as
free as possible from water & Impurities
of all kinds.

The Production of Tartar which is a
Vegitable Acid shall be considered under
the Head of Vinous Fermentation.

Properties of Vegitable Acids.

There is some Variation in the Relation

of those several Species to be ascertained as to their Bodies, tho' they are not dis-
-tinctly ascertained by Experiment.

This Acid unites w: Acids - and w: Alkalies
forming Neutrals w: the latter, with
this Difference from the other Acids, that
no Effervescence succeeds the first Addi-
-tion, but as the Mixture approaches to
Saturation the Effervescence encreases.

It admits of no union w: Inflamma-
-ble except Ardent Spirits, w: which in a very concentrated State it may be com-
-pletely combined.

It unites w: several Metallic Bodies

as Copher, Lead Zinc, and as Dr Lewis

& Mr Margraaf informs us in a very
2h
small proportion w: Fin. it corrodes Iron
and Antimony, and indeed Most Any
Few Metal: Substances w: may not be
dis^d
dissolved by Vegitable Acid if applied after
Precipitation from other Acids.

It may be combined w: all 4 Earths &
Alk^s

are Soluble in Water Acids

When highly concentrated it generates
Heat with Water. and Cold w: Ice.

It acts upon Animal & Vegitable Sub-
= stances as a powerful Antiseptic and
renders Animal Fluids less coagulable,

Whereas the Other Acids very much pro-
=-mote their Coagulation. This Circum-
=-stance perhaps depends more upon the
Redundance of ~~Acids~~ Water which
this Acid is always diluted, even in its
most concentrated State, than upon
any peculiar Property of the Acid.

Of Acids in general.

All Acids retain their Fluidity more
strongly than water, tho' in certain De-
=-grees of Cold they may be rendered solid.
The more any Acid is concentrated the mo-
=-re
its freezing point encreases. Acids when
quite pure are of much greater Specific

Gravity than water. this however is di:
=minished in proportion to the Quantity of
water present, so that probably if we could
obtain them perfectly free from foreign
matters, their Specific Gravities would be
equal. In Acids also of equal Degree
of purity neither the Colour Taste nor Odour
can be distinguished, but dementorily
to depend upon extraneous matters.
These Facts are favourable to the Opinion
of some who think there is but One prin:
=genial Acid in Nature.

It is the general property of all Acids
to unite with Alkalies forming Neutral
Salts wch possess the properties of neither

simple Ingredients before mixture.
Acids & bases with Alkalies producing
Heat except when very much diluted,
at w.ch state they generate Cold with the mild
volatile Alkali. The Reason of this perhaps
is That the Cold generated by $\frac{e}{y}$ Alkali &
water exceeds the Heat generated by $\frac{e}{y}$ Acid
& Alkali. The different Acids require
different proportions of Alkali for their
Saturation. Mr Homberg has endeavoured
to ascertain these proportions, yet his Ex-
=periments for this purpose are very inac-
=curate. First because he determines the
power of Saturation by the additional
weight of the Alkali after mixture,

without considering that the Land supplies
also the Weight of the first Air which es:
-capes in Consequence of the Elation. a
second Objection to his Experiments is,
that he examined the Salts in Crystals,
which we shall prove to contain a large
proportion of water. we can however
the
w: Certainty affirm that y: Acid re:
-quire more or less of Alkali for their
Saturation.
The Ox and Ox unite w: the y: Oils ex:
-cept the Presence of some foreign Matter
prevents the Combination. hence proba:
-bly the Reason why the Muriatic and
Vegitable Acids do not dissolve Oils be:
-cause

we never can obtain them but in a very dilute State. We are somewhat confirmed in this Opinion, since the Sulphurous and Oxygenated Acids may be entirely deprived of their power to dissolve Oils by a proper Dilution w: water. The Oxy and Oxy also unite w: Alcohol, but if considerably diluted they become incapable of such an Union as the Muriatic or Sulphur. — None of the Acids unite w: Sulphur. all Metal: Substances may be dissolved by the Acids either separately or in Combination w: each other. The Effects of Acids upon M S: as

extremely opposite. E.g: The Vitriolic Acid will not dissolve Copper except in a highly concentrated State, Whereas it will not dissolve Iron except in a very dilute State. The all the Acids unite w: every Species of Absorbent Earths.

When highly concentrated they all attract water from the dryest Air.

Acids dissolve all or some of the Integrediants in every Animal & Vegitable Substance destroying their Texture & changing their Colour more or less to a black. They are very powerful Coagulaters of the Animal Fluids.

From this comparative & general view
of the acids we are led to conclude y:
the Opinion of some is not universable
who suppose that there is but one pri:
=mogenial Acid in nature, and y: 4 2d differn
Species which we can examine are no:
=thing more than various modifications
of this Acid with foreign matters. we
have never been able as yet to discover
the substances which produce 4 2d different
Acids. we can only determine w: certainty
=tainty that they contain water, air
& perhaps an Inflammable principle.
Some Chem: is to have shot y: the O4
is the Principle Acid, but this Opini:
=on cannot be supported since we are

Able to analize it into its different parts.
Mr: Bomberg on the other hand not only
denies that any of our Acids are truely
primitive, but also describes the Bodies w:
the Sulphurs combine w: a primitive Acid
in the Formation of the Sour. he says 4:
There are three Kinds of Sulphur. viz: -
Bituminous, Metallic & Vegetable. 4:
a primogenial Acid united w: 4 first of
these produces the Vitriolic - w the 2: the
Muriatic, with the 3: and last the Nitrous
and Vegitable. This Opinion of Bombergs
is not quite so chimerical as might at
first sight appear. for the Or seems to
have the strongest Relation to Bituminous,

the ☉ to Metallic and the ☽ and ☿
to Vegitable Bodies. we shall not how-
=ever be able to prove a Principle
laid 'till we can transmit them into
each other.

There are other Acids different perhaps
from any we have mentioned. the Acid
ch.
w: rises after the Dissipation of the Oil
of Water of Animal Bodies - of Horseshoes
of Urine - the Acids of Arsenic - Amber
Borax and of several Bituminous Bodies
seem to be each a separate & distinct
Species: but as their Chemical History is
not sufficiently established, we shall enter
upon it here, but proceed to ye Division of
the Saline Bodies called Alkaline.

Of Alkalies in General.

There are three Species of Alkalies viz:
the Vegitable, the Fossile, & Volatile.
a Definition of them may be seen
under the general head of the Objects of
Chemistry. These are again subdivided
in Caustic and mild. in the Latter state
they produce a violent Effervescence with
Acids, wch has procured them ye Appella-
tion of Effervescent. But in the Latter
no Effervescence succeeds the Union, hence
Caustic Alkalies are called Non-Effer-
-vescents - the mild Alkalies contain a great
Quantity of fixt Air. upon ye Application

Of Alkalies

Absorption of Aird this Air escapes rapidly in an Elastic State, and produces the violent Commotion in the Miature which has been called Effervescence. Alkalies become Caustic when deprived of their Air. if then Aird are applied to them in a perfectly Caustic State, it is evident: no Effervescence will attend their Union, because the Alkali is deprived of any Air which the Acid could restore to an Elastic State.

First Alkalies attract Air more strongly than the volatile, wherefore if we

Of Alkalies

add a portion of Caustic fixt Alkali to mild volatile, the fixt by receiving ye Air becomes mild, and the volatile by loosing it becomes Caustic. This Experiment may be reversed. as may be seen in mr Bridés Experiments. &c

Caustic Alkalies dilaquesce readily in the Air, especially the volatile which can scarcely be obtained Caustic in a Crystallin State. Quick Lime is a saline Substance rendered mild by Calcination, and is upon that acc: employed for rendering fixed Alkalies Caustic.

Of Vegitable fixt Alkali.

This is an Artificial Substance procured by Art chiefly from the Incineration of Vegitables. It is as yet a matter of Doubt whether this Alkali formally exists in Vegitables, or whether it is generated in Incineration. It may easily be obtained from Nitre, but this Practice suits the Private Chemist only, being much too expensive for Large works. Since Sir Geo. Prau: has upon Vegitables is most univer: sally interesting, I shall briefly confine myself to the Description of it. The Private Chemist ought to

Of the Veg.ble fixt Alkali

make use of German pot-ash, which is an Alkali calcined after being obtained in the Common Method. but for large works we may chuse promiscuously any vegitables which the Climate affords, except the very inflammable & resinous woods. for these yeild by Incineration an inconsiderable Quantity of Alkali occasioned either by the lesser Quantity present, or a Dissipation from ye Quick Inflamation of such vegitables. I am inclined to think it do's under whose the last Circumstance.

During the Calcination of Vegitab.s we must not admit too much Air, last

it dissipate the Ashes, nor entirely ca-
-cine it Otherwise the most intense
Fire will reduce the Vegitable matter
only to a Charcoal. The Ashes being
prepared we must Lixiviate them in
Pure th w: water, we extract three or four
Infusions from each tube, and y last if
very dilute may be returned upon the
next tube. The Ley is to be collected from
the Tubes, and the Alkali Obtained by
Evaporation. Care must be taken
in exporting this Ley always to keep
it of an equal Height in the Vessel to
as much Salt is precipitated as the
Vessel will conveniently hold. For if we

Of the veg: fixt Alkali

evaporate to Dryness, the Alkali conceals
so hard to the senses, that in locating it
& we shall hazard their safety. In several
parts of England they obtain the Alkali
from the Incineration of Straw wch has
been infused in Ley. But as the Straw is
then very difficulty inflamed we can:
= not procure the Alkali free from part
of the Phlogiston of the Straw.

Tartar which is produced by various
and Acetous Fermentations affords fixt
vegitable Alkali in greater proportion &
purity than any Body whatsoever. it
will also contrary to all vegitable matter
suffer a Calination tho excluded from

Of the Vegt: fixt Alkali

the external Air.

The Practise for obtaining this Alkali from Nitre is fully described by Mar-
=quer. It is done by deflagration w:
Charcoal, all mettalic Filings except
Gold and Silver, and w: Tartar which
absorbs the Acid from the Nitre. if q: Nitre
and Tartar are added in such proportions
as that the Acid of Nitre may sufficiently
carry off the Phlogiston of Tartar. the Resi:
-duum will be, from the Nitre a pure Vegt:
Alkali, and from the Tartar a white
powder called White Flux. but if
the Quantity of Tartar predominates
greatly, we shall obtain after Defla:
=gration, from the Nitre an Alkali as

Of the Vulg: fixt Alkali

before, but from the Tartar a dark colour-
-ed mass so called Black Flux. —

Fixt: Vulg: Alkali is always more or
less Caustic, in proportion to y^e Heat em-
ployed in its Calination, tho' we cannot
render it perfectly so by Fire, because in
a certain Degree of Heat it fuses, and then
parts wth its Air very difficultly. in which a
State it corrodes, and passes
Heat likewise it corrodes, and passes
thro' any Vessels we can employ, except
Gold and Silver, and even these will
not bear Heat enough to render the practice
convenient. Since therefore Calination
will not answer our Intention, we must

Of the Veg: fixt Alkali

employ some Body y: will attract $\frac{2}{3}$ y Air of the Alkali, without uniting w: it. for this purpose three parts of Quick-lime to one added to one of Alkali is extremely convenient. This mixture is to be stirred in Water, when the following Elective Attraction takes place. The Quick-lime will attract the Mephitic Air of the Alkali, and the Alkali uniting w: $\frac{2}{3}$ the Water is perfectly suspended, while the Quick-lime is precipitated in the form of Calcarious Earth, having been rendered mild by the Air of the Alkali. The Liquid must be at rest till the Earth subsides when the

Of the Vg: Fixt Alkali

Liquor impregnated w: Alkali may be
decanted. Alkali may be also rendered
Caustic if mixed w: Alkali, and applied
to the Fire. Another Method is to calcine
the Alkalies w: their own Earth, or w: the
Calces of Mt: except Gold, Silver &
perhaps Arsenic for preventing Fusion.
N.B: When the water impregnated w:
Alkali is decanted we must seperate them
by Evaporation to Dryness.

The Caustic Alkali however remains
but a very short time in a dry Form,
because it diliquesces & y: very rapidly.
on this Acc: It is almost impossible

Of the fixt veg: Alkali

to preserve a caustic Alkali in a
dry or Crystallized form, for any length
of time; but when it is mild it readily
converts into fine pellucid Crystals. q.
best way of getting fixt Alkali perfectly
mild is to expose it in broad shallow
vessels to the air, from whence it will
attract a sufficient quantity of the
moisture for its Crystallization, or it may
be done by boiling the Alkali over q.
steam of fermenting liquor. —

Properties of fixt veg: Alkali

It always has a peculiar acrid taste,
more or less as it is caustic or mild.

Vta fixt: Vg: Alkali

Saliva contains an Ammoniacal
Salt which is discoverd by fixt Alkali.
Hence the tenacious Paste which some chemists
have described. it is of a snow white Colour
when perfectly pure. it emits no sensible
Odour. it dilaquesces when caustic, but
concretes firmly when mild. in either state
it unites w: all the Acids without any dif:
=ference in the Neutral Salts produced by
each. it effervesces w: Vtum in a mild state
only. it has a stronger attraction to Acids
than volatile Alkali.

It unites w: Oils forming Soaps. but
when it is perfectly mild there are many

Of the Veg: fixt Alkali

with which it will not unite, and heme
the use of Quick-Lime among the
Soap-Boilers. it unites w: highly
concentrated Alcohol only when
Caustic: but if the Alcohol be very di:
-lute, the Alkali will unite w: ℔ ℥ water
of the Alcohol, and remain separate.
hence the use of Alkali for concentra:
-ting Ardent Spirits. it unites inti:
-mately w: ℔ Sulphur forming a Soapor
Hepar Sulphuris. any of the Acids decom:
-pose this, and produce a peculiar fetid
Odour.
It dissolves none of the Metallic Bodies

Of the 4th fixt Alkali

except Lead and Copper in their proper
Form: but unites with most of them when
precipitated from Acids. it disposes M.S.
to Fusion and them unites with all of them.
— its Effects are most considerable upon
Ores, because they usually contain a large
quantity of Sulphur which with the fixt Alkali
producing Hepar becomes a very pow-
erful Flux to metal: substances.

It unites with all Earthy Bodies, and
acts powerfully as a Flux, rendering some
Earths which alone are absolutely refracto-
ry. If caustic to a Solution of
Calcarious Earth in Acid, the Earth will

Of the 2ds: fixt Alkali

be precipitated in a perfect State of Quicklime. Hence we may draw two Conclusions 1st That the Opinion of Some is groundless who suppose that remarkable virtues are imparted to Quicklime during Calcination, and 2dly That saline, Earthy and perhaps Metallic Bodies are suspended in Acids in a Caustic State or in other words deprived of their fixt Air.

The affinity to Air and water is evident from its becoming mild when exposed to the Atmosphere. Caustic Alkali may be dissolved in equal portions of water, but when perfectly mild

Of the Veg: fixt Alkali

it is not dobule in less than 8 times its

own weight.

Caustic Alkali in Solution dissolves ani-

-mal and vegitable Substances of all kinds.

- When it is not very caustic it acts chiefly

upon the Glutinous and Juicy parts

of those ~~vegitables~~ Bodies in which their

Colour usually consists, and hence the

Foundation of its use in the Art of Blea-

=ching. [For an Ac: of its dymonima

on Blachs Chemistry vol: 2 -]

Fixt Fossile Alkali

Is a native substance very generally dis-
=persed thro the Earth, either in a
Separate or Compound State. It is ℔
first of these it is found efflorescing from
the walls that are exposed to Cold and
Moisture — in a pure crystalized state
in the Earth, and Exuding to Athal
-Hassan in the Springs called Alci=
-dulæ. — In a compound State it is
found in an Earth near Smyrna call
=ed Soap=Earth — in Borax — Glauber's
& common Salt. This Alkali seems to
be ℔ with the Ancients called Netrum or
Nitrum, from the great Analogy be-
=twen

Fixt fossil Alkali

The Descriptions given of the former, and
the well known Properties of y^e^ latter. I
shall give only an Illustration of this Mat-
=ter. Solomon says "to sing songs w:
a heavy Heart, is like the mingling of
Vinegar, and Nitre" — If we suppose he
meant the Neutral Salt which we call
Nitre, the Allusion is no way striking.
but if we suppose he alluded to y^e^ Com-
=flict or Effervescence w:^ch^ would attend the
Mixture of Vinegar w:^th^ an Alkali, y^e^ Figure
is beautiful, and worthy the great Author
who wrote it. —

The Arabians who lived upon the
Sea Coast obtained their fixed Salt from

Sist Kofiillkhali

Maritime productions entirely, especially
a Plant called Kali. This Practice was
long confined to Arabia & Asia, but
it is now common in many parts of
Europe especially upon the Coasts of
Spain bordering upon the Mediterra-
-nean, where the proper plants grow
very plentifully. After this Practice
was communicated by the Arabians
to the Europeans such of the latter as were
contiguous to the Sea Coast obtained
their Salt from any Vegitables which
the Country afforded, and consequently
got the Name: sist kkhali: This they called
from the word Kali alkhali but made

Fixt Fossile Alkali

no Distinction between the Fossil and
Vegitable. M.r Boyle observing some
Difference in the common Alkali,
and that imported from the Levant, stat-
-ted some Conjectures w.th Respect to two
Species of fixt Alkali. D.r Thalrenow-
-mended to his Pupils an Investigati-
-on of the Properties of each. This how-
-ever was neglected till M.r D.r Stahel pub
published a Dissertation upon y.e Fossile
Alkali. This excited Chemists & Other
Nations to make Inquiries, and it is
now universally allowed to be a distinct
Species of fixt Alkaline Salt.

Method of getting the Fossil Alkali

In Britain all Vegitables which are

First Refine the Alkali

found upon the Sea-Shore are employed
for this purpose. They are dried in cisterns
=rated, lixiviated &c, according to the
Directions given for Obtaining Vegi
=table Alkali. The Alkali Obtained is
a concrete mass, contains a portion
of Common Salt, Glauber's Salt &
inflammable matter. This answers very
well the purposes of several Mechanicks
as Glass makers - Soap Boilers &c. but
if we require it in a very pure State
for nice Operations, we must calcine
the Alkali brought from the Mediterranean
which is Abundantly more pure from

First Setofile Alkali

extraneous Matters than ℔ Common

British Kelp.

As this Alkali is the Basis of Common
Salt, and Sal Glauberi, we may get it
from either by proper Management. if
we use the former we must add Nitrous
Acid, w: decomposes the Acid of ℔ common
Salt, and unites w: its Alkali into a Cubic
Nitre. This must be deflagrated with
Charcoal when the Nitrous Acid will ex-
-hale, and the Alkali remain seperate.
Glauberis Salt deflagrated w: ℔ Charcoal
forms a Hepar sulphuris from which
the Alkali may be attracted by any
Acid. The Vegitable is best, because it

may be more readily dissipated than
any other. The Lessons Alkali more ea-
=ly crystalizes in a Caustic state than
the Vegetable, but since the latter
may the w: much Difficulty, be ob-
=tained in a Crystalline Form, that
Property cannot be a universal mark
for distinguishing the two as Some
Authors have alledged. When these
Crystals are exposed to the air, and
=cined powder appears upon their sur-
=face, w: soon afterwards deliquiates.
It is less soluble in water than y Vegit
=ble, and will not unite w: it even in

First Fossil Alkali

Fusion. It unites with all the acids like the vegetable, only producing different neutrals. Their Effects upon Inflammable, metallic, Earthy, watery, Animal & vegetable Bodies are very exactly similar.

This Alkali has been called Natrum Egyptiacum to distinguish it from mineral salts. The Spaniards call it Soda, & Barilla from two plants of that name which afford it. The Italians use it in a concrete state, when they call it Rochetta, or in a Powdery Form when they call it Pulverina. The procurate Alkali prepared in Britain is called Kelp. we

Fixt Fossile Alkali

also import it much purer from the Town of Alicant, which is distinguished by the name of Alicant Kelp.

Of the volatile Alkali.

This Substance is Obtained by Artificial means only being never found in a Native State. When two Atoms are Much Dis=
=posed to Act Chemically against each Other, a Smell arises which Some Chemists have Not Similar to that of Volatile Alkali, and Some affir=
=med that it was a Volatile Substance. But if Such an Odour can be Observed After the Collision of two Stones, we Should rather Suppose that it was collected by the Stones which during Concussion might have entangled various Animal and

Volatile Alkali

Vegitable Substances which always
contain a volatile Alkali, & this in a
much greater proportion when they are
subjected to Putrefaction. It is found y: h
the Solid parts of Animals afford this
Salt in the greatest Abundance; and
Chemists have thot that Heart-horn affor-
-ded a kind of peculiar Excellency, & them
the genral Term Sp: Cornu Cervi. It is now
however known that the Bone, Horn
Hoofs of Animals under proper Manag
-ment produce volatile Spirits similar
y: of Hart-horn, w: ch pass under y: Original
Name of Sp: Cornu Cervi. The Practis

Volatile Alkali

upon Animal and Vegitable Substances is
performed by Distillation Slow, and Duly
proper for large works. Common Ammo-
=nia is a Subject from which this Sub=
=stance may be most readily Obtained by
the private Chemist. The Process is to Cap
carried on by Distillation w.th fixt Alkali,
Calcarious Earth, or Metallic Substances. -
I mention the latter rather to inform
you of the Fact than to recommend y.e
Practise w.th Metal. Sub.s - Calcarious
Earth is best because it gives y.e Alkali
in the most firm Condition. if 3 pounds
of Calcarious Earth be added to 4 of
Sal Armon.c we shall Obtain in Distil.
=lation

Volatile Alkali

One pound of Alkali in a Volatile state
= bis great proportion of Vol: Alk.
has long been a matter of Admiration
= on to the French Chemists; but I
think the Phanomena may be
solved by considering that ½ Alkali
of the Ammonia is in a caustic
state, that ½ Calcarious Earth &c.
= comprises it, and unites w: the Acid,
& that ½ Alkali absorbs the Air
= ated from the Earth during its
Combination, w: Absorbtion not only
render it mild, but encreases its weight
also. This Opinion is further con:
= firmed

Volatile Alkali

Experiment. 3ij to 3ij of Sal Ammon.
& added 3iij of Quick-Lime, or fixt
Caustic Alkali, we shall not obtain
a third part of the Quantity obtained in
the last Operation. —

Volatile Alkali may be artificially
produced from a Combination of all the
Acids (except the Negitable) w: fixt Alkali.
— Thus if we collect the Fumes of Nitre,
- fixt Ammoniacal Salt composed of
Muriatic Acid, and Calcarious Earth.
or Hepar Sulphuris when deflagrated
the w: Charcoal. they all afford a spirit of
Volatile Salt. Vitriolated Tartar digested
the w: Alkohol produces a Vitriolic Am-
=moniac

Volatile Alkali

From wch we can get the volatile Alkali.

Volatile Alkali when mild readily admits of a Crystalization. it will crystalize when it is not perfectly mild. but when it is more apt to dilaquesce. When it is perfectly Caustic it can be obtained in a fluid Form Only. it emits pungent Odour when mild, and in its perfectly Caustic State, it is one of ye most pow-erfull, and volatile Bodies we are acquainted with.

It is dissolved in Acids wch the same Phanomena as fixt Alkalies. forming peculiar Neutral Salts distinguished by the Epithet of Ammoniacal. &c

Volatile Alkali

more weakly attracted by Acids than fixt Alkali, magnesia, Calcarious Earths & Metallic Substances.

When mild it does not unite w: any Inflammable Matters; but in its Caustic State it unites w: all. this union however does not seem complete, for it soon recovers Air from them & Effervesces. it unites w: Sulphur by Solution, and they both rise in Distillation.

Its Effects upon Metallic Bodies are not sufficiently ascertained, yet we know that it dissolves Copper, & several other Metals when precipitated from Acids. —

It does not unite w: any Earths.

Mr Duhamel observes that Fixt & Alkalis

Volatile Alkali

Ammoniac is blended w: ℔ Earths, Gums
if ℔j of Ammon: be distilled w: ℔ij or ℔ij
of Lime: Earth, we shall obtain ℔i
of Volat: Alkali, but we have already
explained this upon much more Obvi:
-ous Principles.

Its Effects upon Animal Oeconomy
Bodies are the same as those of fixt Alk:
=kali, and it is reckoned a more pow:
=erful Antiseptic. —

It generates Cold w: ℔ water when very
dilute or mild: but when Caustic and
pure it generates Heat like other Alkalies.

When this is obtained from Ani:
=mal Bodies, it is called Sp: C. Cervi
- when from Ammoniac Sp: Am:
=moniac.

Volatile Alkali

Sal volat: Sp^r Ammoniac cum Calce viva. —

Some Chemists have imagined and not improbably that as there is only one primogenial Acid, so there is but one primogenial Alkali; different modifications of which appear to us as distinct Species of Alkali. —

Of Neutral Salts.

Neutral Salts are produced by a mixture of an Acid and Alkali to the point of Saturation. These have been called by the Chemists Sales Salini because each of the Ingredients are saline. Sales medii are by a Compound was in an intermediate State between the Acid and Alkali, but since their Properties are entirely changed, & a tertium quid produced, I think the best Epithet we can give them is Neutral. Chemists have expressed great Anxiety about determining the point of Saturation. Tho' in general I

Neutral salts

by a think we need not be very exact w:
Respect to the proportions added. provided
there is end of the Acid. Some Neutrals
however require a very nice Adjustment
of the point of Saturation! we may
therefore add red or blue coulored Liq:
or Paper tinged w: the Juice of these; if
the Acid prevails the Colour will be=
=come red, — if the Alkali the Colour be=
=come green, but if the Mixture is per=
=fectly neutral it discharges y^r Colour
altogether. Those Salts are often formed
by employing Mixed Bodies as shall
be shewn more fully hereafter.

Neutral salts

Neutral salts when formed may be
decomposed by various means, and
many by the Force of Fire alone.
But the Neutrals formed with Nitric
Acid, and the Ammoniacal salts co-
-ver sublime altogether than decom-
-pose when subjected to Heat. Some of them
may be decomposed by Deflagrati-
-on w: Inflam: be matter, &
many by Elective Attraction in Conse-
-quence of the addition of Acids. —
The Nitric Acid having the strong-
-er Attraction to Alkalies, may decompose
all the Neutrals formed by y Nitrous

Neutral Salts

Muriatic and Vegetable. The Nitrous
decomposes those formed by Muriatic
& Veg: — The Muriatic those formed by
the Vegetable Only. for the particular
Neutrals formed by the Acids & Alkalies.
see the Table at the Beginning of Lower
Chemical History.

The Ammoniacal Salts may all be de-
-composed by fixt Alkalies Perish Lime &c.
- we shall now proceed to Treat of the
particular Neutrals, viz the Order &c
-cording to the Table before mentioned.

Vitriolated Tartar

This Salt compound of Vitriolic Acid
& fixed Vegitable Alkali is perhaps
entirely an Artificial Production.
Some have thought it was a native
Substance, because it has been found
in Ashes of Vegitables after Incineration
— but since it is never found in wholly
Vegitables we may with more probability
suppose that its Formation depended upon
an Acid imbibed from the Air, or to a
peculiar Effect of the Fire. —

There are four Methods of forming
this Salt — 1st By taking the Acid & Alkali
both in a Separate State, 2nd By taking

Vitriolated Tartar

The Alkali acid in a separate, and the Alkali in a miat State. 3.ly By taking the Alkali separate, and 4.ly Acid miat & 5.ly By taking two Compounds. This will be illustrated by the following Table in which all the Bodies are enumerated w.ch we can employ in the 4 Cases mention=ed for Obtaining Vitriolated Tartar.

Case 1.st { Vitriolic Acid — — first Veg.: Alkali

Case 2.nd { Vitriol.: Acid — — Nitre
— — — — — Digestive Salt
— — — — — Regen.: Tartar
— — — — — Cakes of Veg.: Alkali
— — — — — Repar.d Sal Enxis

Case 3.tio { Vegitat.: Alkali — Vitriol.: Ammon.a
— — — — — Vitriols
— — — — — Xantho.ts w.h Vit.: Acid
— — — — — Sulphur.

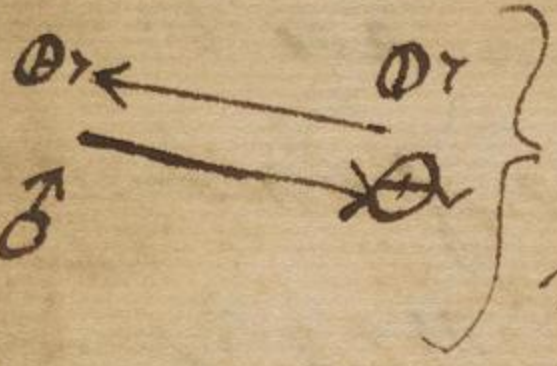
Vitriolated Tartar

Case 1st { Vitriolic Ammon — Neutrals of Veg: alkali.

Vitriols
Earths w: ~~Veg: alk:~~ — — —
Sulphur — — — — Nitre

In the 1st Case the Practice is very inconvenient; for when ye Vitriol: Ammoniac is applied to Neutrals containing Veg: Alkali, as for Instance Nitre, the Acid of the Ammoniac unites w: the Alkali of the Nitre into a Vitriolated Tartar, And ye Acid of the Nitre forms w: the Alkali of Ammoniac a Nitrous Ammoniac w: must be separated by sufficient Degree of Heat. if Green Vitriol be applied to Nitre y^e following

Vitriolated Tartar

double Elective Attraction will take
place.  hand the de-
-gree of heat necessary to
seperate ~~the combination~~, the
Vitriolated Tartar from the new
Combination of Nitrous acid & Iron
will be found extremely inconvenient.
In the same manner we might draw
Schemes for the Combinations w:
form all the Neutrals: but we shall
leave them to yourselves by way of
Exercise, and proceed to consider w: is
the best method of Obtaining Vitriolated
Tartar.

The Combination of the Acid &

Vitriolated Tartar

Alkali as in Case 1: may deem y^e Lent,
Lent y^e point of Saturation is so diffi-
=cultly hit, that it is almost impos-
=sible to Obtain it pure this way. Tho
=nice Consider of this Inconvenience
practise upon Same of y^e Subjects in
Case the 3.^d which will yeild no more
of their Acid than is just sufficient to
Saturate the Alkali, we Propose Vi-
triolated Tartar by this Means
extremely pure. Sulphur de fragrate
the Vitriol gives a Volatile Vitriolick Acid
which unites wth the Alkali of the

Vitriolated Tartar

Nitre (its Acid being dissipated wh ℔ ℥
Inflammable principle of the sulphur) D
forms a Salt called Polychrestum. this
is much more soluble than Vitriolated
Tartar, and ought perhaps to super-
-sede it in all Prescriptions. imediately
after the Deflagration we must secure
the Salt in very close Vessels. for any
ch
Means wh. we can practice for purify-
-ing this Salt will also render it upa
Vitriolated Tartar by restoring its Acid
to a fixt State. —

Chemists have given various
Denominations to this Salt as obtained

Vitriolated Tartar

Some different Subjects. When obtained
from Tartar and Vitriolic Acid, it is
called Nitrum vitriolatum. When ob-
=tained from the Matter in Case 4:
it has been called Sal Prunum Par-
=celsi. Sal Duobus. Arcanum Du-
=plicatum. Panacea Ducis Holsatii

℞

When prepared w: Antimony it
is called Nitrum Stibiatum. When
prepared from Sulphur & Nitre it is
called Sal Polychrestum. This is nothing
more than a Vitriolated Tartar when
Liquid is in a Volatile State.

Vitriolated Tartar.

The Properties of this Salt are as follows.
It is of a remarkable firm Concretion,
— of difficult Solution in Water — assum-
-ing the form of hexagonal Crystals; it is the
most difficultly fused of any Salt whatever.
— with a small Degree of Heat it decrepi-
-tates. it may be decomposed by Solu-
-tates. it converts it into Sulphur-
-ous Acid. When Vitriol. Tartar is ap-
-plied to a Solution of Silver in Ni-
-trous Acid, a Decomposition will take
place in Consequence of an Elective
Attraction discribed in the following Diag:

Vitriol Tartar
in a State of the
Gas.

This is a true
Solution of Dr.
Black's problem
for decomposing

Of Glauber's Salt.

This is a native Substance composed
of Vitriolic Acid & Fossile Alkali. It
may be also produced Artificially by
the various Combinations mentioned
in ye Table of Vitriolated Tartar, which
Table will serve likewise for Glauber's
Salt if we substitute the word "Fossile
Alkali" in the Room of Vegitable. But
the most convenient Method is by
Distillation wth Common Salt and
Vitriolic Acid. in this Process ye Vitriolic
Acid decomposes the Acid of Com-
-mon Salt, which must be dephlegmated
by Heat when the Vitriolic will be left

Glauber's Salt

combined w: the Fossile Alkali. ℈ Neutral
thus formed differs considerably from
Vitriolated Tartar. - The latter crystals
very firmly - is difficultly soluble in
water, & extremely fixt in the Fire ℈:
former is of a very loose texture, easily
soluble in water, and very fusible in Fire.
Vitriolated Tartar receives a small
proportion of water into its Crystals. Glau-
-ber's Salt the greatest of any Neutral What-
-soever. This Salt calcined & added to
water forms a Coagulum provided free
Access of the external Air be admitted.
- It may be decomposed by ℈ same
Method as Vitriolated Tartar.

Common Nitre

This Substance was quite unknown to the Ancient Greeks and Romans. — The Arabians first manufactured this Salt, and by them it was introduced into Europe. It is now chiefly imported from Asia. Tho' whether it is an Artificial or natural production we are not certainly informed. Probably the former because it is never found native in Europe. The most Authentic Accounts we have received concerning the Production of Nitre in Asia is, that in a dry Season they set fire to the Grass or

Common Nitre

Surface of their Land. When Rains fall the
Alkali produced is washed to a small
Depth in the Earth, where it meets with
a Nitrous Acid. The Earth thus impregnated
yields its Nitre by Lixiviation & Evapora-
-tion.

To obtain Nitre most conveniently in
Europe, we ought to chuse a Clay Soil as
a Matrix. This ought be impregnated with
Animal, and Veg: Bodies as strongly
as possible. The Putrefaction of these
is greatly expedited by the Addition
of Lime-Lime. This matter will also
resolve the viscid tenacious Texture of
the Clay which might otherwise incre-
-ase

Common Nitre

part of the Salt. common Salt added
to this putrescent matter is in some
Measure converted into Nitre, and
never fails to be generated more or less
during the Putrefaction. This Matria
must be exposed to the Air by as large
a Surface as possible, and defended en-
=tirely from the Rain: so essentially
necessary is the Air not only to Putrefac-
=tion, but to the Generation of particular
saline matter, that we not find the
Matrix impregnated enough for use at
more than an Inch from its Surface.
— The Salts generated by those Nitrous

Common Nitre

Matters will be volatile Alkali, and Ni-
-trous Acid, forming Nitrous Ammoniac.
- If then we lixiviate it w: strong fixt
Alkaline Ley, it is evident y: by Evaporation
we may obtain a Common Nitre, in
Consequence of y: Decomposition of y: Am-
-moniac. in this process a portion of
Common Salt will be produced, which
by a proper Crystalization may be se-
-perated from the Nitre.

Spring, & Autumn are proper Seasons
for the Preparation of Nitre, because Fu-
-sion is retarded by y: violent Cold
in Winter, and the Saline Matter when
generated are exausted by the intense heat

Common Nitre

of Summer. Since we see ye Reason
why in hot Countries Nitre is produ-
-ced best when its Matria is exposed to
Northern winds, and at ye same time
we see the Fallacy of an Opinion y^ch^
some have entertained y^t^ Nitre floats
in the atmosphere from Northern to
Southern Regions. ——

Calcareous Nitre.

This Substance consisted of Lapis Calca-
reous, and Nitrous Acid is very rarely found
prepared by Nature, and then very near
the Surface of the Earth only. This con-
firms the Opinion that Nitrous Acid
never exists independant of putrid Ani-
mal or Vegitable Matters. a great
Quantity of this Acid is certainly washed
into the Bowels of the Earth; yet we
never find it under any Appearance,
but at a very small Distance from the
Surface of the Earth. this leads us to sus-
pect that by the Oconomy of y^e Earth
Nitrous, after passing a considerable

Cubic Nitre

Deflgtd. is converted into the Cubic Nitre
Cubic Nitre may be obtained by adding
the Nitrous Acid to the Fossile Alkali, or
by distilling the former w: common
Salt. This Neutral concretes into Rhom
= bridal Crystals: but in other Properties
it may exactly resemble Common Nitre

Of Common Salt

Common or Alimentary Salt is a no-
=ble Substance, collected in vast Masses
in the Bowels of the Earth as in the Mines
of Lithuania & Cracow in Poland, or
diffused thro' the waters of the Ocean,
or the waters of Springs. When it is got
from Mines it is called Rock-Salt or
Sal Gem, but as the Production of Salt
from impregnated waters more imme-
-diately belongs to the Business of the
Chemist, I shall confine myself chiefly
to a Detail of that Practice, & only ob-
=serve here w.th Respect to y.e Sal Gem y.t
frequently metallic and Earthy Matters

Common Salt

adhere to it. we discover the first of these
by the blue or green colour which they
impart, and the latter by its adhesion in
substance to the surface of the salts in
either case it may be ascertained by Electri-
-city.

Common salt is prepared from sea-
-impregnated waters by Evaporation with
Heat of the Sun or Culinary Fires. This is
very much expedited by admitting ¼ Air
to as large a surface as possible of the
Liquor before, and during the Evaporation.
To effect the last of these purposes we
may employ large broad Vessels: for the

Common Salt

first some have contrived long narrow
Houses. in Shape About 20 Feet asunder
are built two Floors in y^e^ form of Cisterns
for holding the water. the upper Cistern
or Floor is perforated wth numerous small
Holes, thro wch the water falls into y^e^ System
below, thro a swift Current of Air into=
=duced by a Door in each side of y^e^ House.
— The Contrivance has been improved by
overspreading Brush wood between y^e^ Floors
by which means the Surface of y^e^ water
is very much enlarged & Consequently
Evaporation so much expedited. wth a
Convenience of this Sort we may reduce

Common Salt

The water is a saturated brine, w: ch
may be crystalized w: a small expence
of Fewel. a Method this w: is practised
in Germany.

In Britain there are several manu-
factures for Salt of Sea water. this is
done in large Boilers w: containing about
4h
The Evaporation either from y Ignorance
or Avarice of the Proprietors is generally
pushed too far, whence two Inconveni-
ences arise 1:st the Salt by too great
Heat is in some Degree decomposed,
ch
by w: its Antiseptic power is destroyed
& 2:ly a portion of Nitrious Gas

Common Salt

Salt always present in the waters of the
Ocean conecting with common salt.
Whereas by a more moderate Evaporation
the former would have remained entire-
-ly suspended, while the latter would
have concreted in a pure State. Sea
water, and Salt Springs generally con=
=tain a large proportion of heterogeneous
matter. This may be separated before
Evaporation by Clarification viz: Whites
of Eggs, or Animal Fluids of any kind
as Blood &c, which entirely entangles
all floating matter, and coagulate on the
Surface. The Salt obtained by Evaporation

Common Salt

is called Bay-Salt, from the great
Quantity produced in the Isle of May
or
w: in of the greatest purity of any exact
the Sal Gem of our mines. it is prow.
=red in the following manner. large
Basons or Reservoirs are formed contigu.
=ous to a Bay in that Island, & only sepa.
=rated from it by a Mole of Sand. thro
this the water filters or is driven over it
in Storms. the water thus collected is ev.
=tirely exhaled by the intense Heat of the
Sun in Summer, & y Salt left
perfect on the Bottom of y Reservoirs.
the Bay Salt of Europe is considerably

Common Salt

Is purer than that of sea, tho obtain'd by the same means. The Dutch purchase this, purify it, and afterwards sell it at a low price. — it is said they add a pow- -der said obtained from Mild, to which the purity of the salt is attributed. but I have not been able to procure this said.

The Residuum of common salt after boiling is called Bittern, or y bitter purging salt. This is composed of Nit: acid, and magnesia. —

Common salt forms Cubical Crys: -tals, and when pure has a fair white Colour — an agreable taste — requires 3 times its weight for solution

Common Salt

— Power of coagulates in the Air — does not easily calcine — not so readily fusible as Nitre, ~~and also~~ nor so refractory as vitriolated Tartar, and a very powerful Antiseptic. as its purity decreases all these Properties will be proportionably diminished. The Quantity of this Salt dissolved by boiling a hot or cold menstruum is nearly the same. —

Dr. Pringle says that a large portion of this Salt acts as an Antizeumic, & a small proportion expels Putrefaction. The Dr. however is certainly mistaken, and his Error probably arose from Impurity of the Salt which he used. —

Digestive salt

This is entirely an Artificial Substance,
consisting of Muriatic Acid, & fixt Vegi=
=table Alkali. The process for Obtaining
it is fully described in the Londondis=
=pensatory. it assumes larger & firmer
Crystals than common Salt, but in
Other Respects they are nearly y^e^ same.

Regenerated Tartar

This Salt composed of Vegetable Acid, & fixt
Veg: Alk: is prepared by last Rule &
may be procured in a very elegant
by the Directions given in 4 last Edit
= on of the Lond: Dispen: 4 — It never
assumes the Form of perfect Crystals,
but appears dry and flaky. Hence it has
been called Terra foliata Tartari, & form
a particular Medicinal Property call
Diureticum. it dilliquesces in 4 least
Exposure to the Air, dissolves in an equal
Weight of Water, & is readily soluable. it
may be decomposed by all Acids. it
unites w: 2k Fixt Vital Oils — Resins — & Gums

Regenerated Tartar

of the Gummy Substance. it unites
th
w: Alkohol/ w: has been employed as a
Test of its purity/ forming a Menstrue m:
ch
for several metallic Substance, on w:
neither Substance separately applied
produces any Change. Thus if a Solu-
-tion of Gold be evaporated or precipi-
-tated the Calx becomes Soluble in a
Mixture of Regenerated ☿ and Alkohol.

Sal Polychrestum of Rochelle.

This is an Artificial Substance com-
-posed of Veg: Acid, and Fossile Alk:
- It was accidentally discovered by One
Seignette an Apothecary of Rochelle in
France, who having used Sp: Alkali
for Obtaining Regenerated Tartar, found
2
y: a Salt was produced of a firmer Tex:
-ture, and of less Solubility than Rege-
=nerated Tartar. he published it accor:
=dingly w: the Appellation of Sal Poly:
-chrestum Rochelle or Seignette. This
Salt Ch: Superse Regen: Tartarisati
Prescriptions. —

Soluble Tartar

This is an Artificial Substance composed of the Acid of Tartar, and fixt Vegitable Alkali. It is said contrary to y^e Opinion of some that this Salt will assume a Crystalline Form if exposed to a moist Air for a sufficient length of time.

Regen: and Soluble Tartar, are the only fixt Alk: Neutrals y: can be dissolved in Alchohol. The Combinati= =on of the Latter w: Alchohol, is not so powerful a Menstruum for Oily Matters as some have supposed. we shall prov= =ed to mention the Neutrals w: y^e Acid form= =ed with Vol. Alk: distingd: by y^e Name of Common

Common Ammoniac

This Salt compos'd of Muriatic Acid,
& Vol: Alk: was unknown to Philo-
-sophers & Romans. w: they call'd
Ammoniacal Salt was nothing more
Sal Gem. There have been many Disputes
whether this is an Artificial or Native
Substance. I think it ought to be
ranked among the former since it is
never found but in Consequence of Ign:
-flammation &c. - It is found in Fissures
of Volcanoes - of Brick Kilns, or burn:
-ning Coal pitts. When soot or smoke
issue. Quere, whether these are Opera:
-tions

Common Ammoniac

of Nature or Art? — It is imported to us chiefly from Asia where it is prepared from the Soot of burnt Cow Dung: that it is never Elicited from the Soot of any In= flammable Fuel. — It may also be made by a Mixture of the separate Ingredients. It concretes into 4 pointed Stars or Crystals. it readily dilaquesces in the Air, but becomes more firm after Sublimation. it sublimes in a very gentle Heat without Decom= position. It is Soluble in Alcohol & Water, generating Cold w: 4 Ths & latter by evaporating its Menstruum for other Salts. in Sublimation it renders several In flammable & Metallic Bodies very volatile. it may be de= compound by Vit. Ac. Nit. Acid & by fixt Alk: S

Vitriolii Ammoniat

This is an Artificial Substance com:
=posed of Vitriolic Acid, & Vol: Alk: Vitri:
=olated Tartar may be converted to this
Substance by Deflagration w: Inflam:
=mable Bodies. It is less soluble in water
than Common Ammoniac, & not at all
Soluble in Alchohol. it also concretes
more firmly, and does not dilaquesce in
the Air. it Sublimes without Decom:
=position tho D.r Hoffman is of a contrary
Opinion. Glauber assigns more Properties
to this Salt than it really possesses. —

Nitrous Ammoniac

Is an Artificial Salt: composed of Nitrous
Acid, and Vol: Alk: - It may like the Other
Ammoniacs be decomposed by Inflam:
:mation, or by Elective Attraction of Other
Bodies. it assumes a Loose concrete Texture
& is readily Soluble in Alcohol or Water.
It is the Only Saline Body we know that
is inflammable without imediate Con:
:tact of burning Bodies. The great Inflam:
:mability of this Salt seems to depend upon
the Quantity of Inflamable Matter
contained in the Vol: Alk: Because
the Disposition of Nitrous Ammoniac to
inflame decreases as we employ a purer Alk:

Vegitable Ammoniac

This Salt formed by any Vegitable
Volatile Alk: is called also Spiritus
Mindereri. it is always very imperfect
we get it from the Shops, & this demand
upon the great Attention that is requisd
for producing an accurate Saturation.
Of the Acid, and Alk: be combined till
all Signs of Effervescence cease, and the
Mixture be kept for some time; upon
the Addition of more Alk: & Effervescence
may be renewed. This may be repeated for
several times. Chemists have been very
anxious to get this Salt in a Solid
Form. The Method generally practisd is

Vegitable Ammoniac

by Sublimation: but y^e^ volatility of y^e^
water, and Salt are so nearly equal, y:
it is attended w: the utmost difficulty
to prevent both from rising. a very con=
=venient Method has been for some time
practised viz: the addition of Regenerated Tartar,
& Vitriolic Ammoniac when an Elective
Attraction takes place as expressed in
y^e^ following Scheme. -

In Distillation the Reg: acid & Vol: alk:
rise, and form in the Receiver a Soft irregu=
=lar

Vegitable Ammoniac

Concretions Soluble in water or Alcohol.

Like Regen: Tartar it encreases ye Mus-
=cular power of the latter, & dilaqueus
readily in the air. — This was employed
by the late Dr: Ward for curing indurated
Swellings of the Testes. —

N.B. We must always take egual Quan-
=tities of the ~~Volatile~~ Vegitab: Acid & Vol: Alk: to
produce the Veg: Ammoniac. ——

Of Borax

This Substance is imported from Asia
in a very impure State, & is afterwards
refined by the People in Europe. tho' the
Original Production & Management of
Borax we are entirely ignorant.

Some have supposed it an Alkali
because it changes the Syr: of Violets
green — disposes Earths to vitrify — pre-
-cipitates Metals dissolved, & very pow-
-erfully promotes their Fusion. but from
unquestionable Experiments it is found
to be a Neutral Salt composed of Earth
Alkali, & a peculiar Acid no where to be
met with but in Borax. Chemists have

B Boras

called this Acid Sedative Salt, and
from M.r Homberg its first discovery
Sea Sedative Salt of Homberg. This Acid
forms tender foliated Concretions w.h
are Soluble in a very small proportion
only, even in boiling water. but by the
Application of Heat it becomes Soluble
in Alchohol. When exposed alone to y.e
moist air it does Heat it suffers no diminution
but w.h the Addition of water it may be
exhaled. it forms Neutrals w.h all y.e Alkalies
-lies, w.h may be Again decomposed by
all the Acids. but the Properties of all the

Borax

except Borax are very little known &
less frequently employed. Sedative salt is
Obtained from Borax by Distillation 22 w:
the vitriolic Acid most conveniently. The
first Distillation affords a small Quantity,
so that it must be 10. or 12 times coho:
:bated before we can get all 4: 4 Borax
will produce. —

Of Inflammable Bodies

The next class of Bodies to be conside=
=red is the Inflammable: But before I
describe these particularly, I shall make
a few general Remarks by wch we may
always distinguish Inflammation from
Ignition. Inflammable Bodies are distin=
=guished by a quick succession of their
parts when exposed to burning Fuel: -
- by the luminous vapour or Flame w^ch
they receive on their Surface, or by the
Exhalation of all those Appearances in
Ignes. Ignition is said to be when
Bodies in Contact wth burning Fuel re=
=ceive a great degree of Heat without

Of Inflammable Bodies

any immediate or sensible Consumption
of their parts, and when those Effects are
readily produced in Gases.

There are certain Bodies in Nature which
appear to be luminous without produc-
-cing or propagating Heat, & which suf-
-fer no Consumption of parts. These are
called Phosphori.

Tho we find such innumerable Bodies
in Nature y: are capable of Inflammation
yet their Inflammability seems to depend
upon the presence of one of these Forms
viz: Oils. Sulphur & Alcohol. I not sus-
-tend to affirm that these are y Only

Inflammable Bodies

Species of Inflammables; but that they are most obvious & universal.

Chemists in general do not suppose that these several forms each possess a distinct Inflammable principle; but that they only different modifications of one primitive Phlogiston. —

We shall now proceed to consider them in order, & first the Oily. These are divided into Expressed, Empyreumatic & Essential.

Expressed Oils

These are formed by nature & deposited
in Animal & Vegitable Bodies, & most
obviously, and frequently in y: former.
— they are free from any peculiar Odour
or Taste, which distinguish them suffi-
-ficiently from the Essential.
— many Disputes have arisen whether
these Oils are produced by y Oeconomy
of Animal Bodies, or whe-
-ther they are taken in here w: Vegitab:
Aliment, and only secreted by proper
Organs? — — — In Spirituat of
a living Animal the Expressed Oils

Expressed Oils

are mostly fluid; but in the ordinary Tem-
perature of the Air they either concrete or
become ~~fla~~ viscid.

Animal Oils are contained in a tender
cellular membrane. Therefore to obtain
them we must first destroy this cellular
texture, then liquify and express them.
In the Liquefaction of expressed Oils the
Heat applied must be extremely mo-
derate, and gradual; Otherwise they soon
become empyreumatic & incapable of
firm Concretion. These Oils when exposed
long to the Air change their white for

Expressed Bile

a brown greenish or bleak colour - &c: bleak

= quite a disagreable Odour & acrid Taste,

and are then said to be Rancescent.

Rancescency ceases to be the Effect of Fer-

= mentation, and this Fermentation ceases

to depend more upon y^e^ Mucilaginous

Matter always more or less present in Bile,

than upon the Bile themselves. for Butter

or &c: of all Animal Bile is the most disposed

to Rancescency, may be kept sweet for

a longer or shorter time, according to the

proportion of the Mucilaginous or other

parts of the milk remaining. How

Rancescency found y^e^ by frequent Liquefac-

= tions

Expressed Oils

Oblentions be procured Better of a very pure

& lasting kind. — Expressed Oils of Animals

unite w: the Acid and Alkalies producing 2h Soaps w: the

latter. They unite also w. 2h Gum Resins, —

producing Neutral Soaps. They unite w 2h Other

Oils, tho' Neither by proper Mixture or So-

lution we do not know. —

They unite w: 2h Sulphur forming Balsam

of Sulphur. — They dissolve several Me-

tals. The Calx of Lead united w: 2h Expressed

Oils forms Common Plaister. They refuse

all Union w: 2h Earths and water, excluding

the Calcareous w: 2h is properly a Saline Body.

They no not afford an Alkali in Cal-

cination like other parts of Animals.

Expressed Oils

In Distillation they give over first a watery
impregnated w: Acid, and then Oils w:
vary somewhat in the different stages
of the Distillation. The Oils thus obtained
have been called

Empyreumatic

From a peculiar fœtid Odour w: they
retain. They are also of a dark Colour.
Acid to the Taste, and soluble in Ardent
Spirits. by repeated Distillations their
Fætor & Acrimony are diminished, and
their Solubility in Ardent Spirits encreased.
They may by this means be rendered quite
colourless and void of fœtid Odour. with this

Extracted Oils

Most Authors have ascribed many Virtues to them. But the Labour of procuring them perfect, and the pains necessary to exclude entirely the external Air, which will quickly bring on Rancescency render Empirical & extensive Practice. if we are careful in conducting the Operation w: a very gentle Heat, and in separating the Faces of each Distillation, three or four Rectifications will be sufficient, tho Dr. Hoffman ad: vises ten or twelve. Quick lime must be added to absorb the water in Oils. —

Expressed Veg: Oils

These are prepared & reposited by na-
=ture chiefly in the Fruits & Seeds of
Vegitables. like the Animal they are
enclosed in cellular substance, & are
to be extricated by the same means.
But as they are generally fluid, we
may omit Liquefaction. because they
are very much disposed to Evanescence
& this Disposition is greatly encrea-
=sed by Heat. When obtained from
the most acrid vegitables they are perfect-
=ly inodorous. Their Chemical proper-
=ties & Relation to other Bodies be-
precisely the same as the Animal. They
also afford by Distillation — L —

Empyreumatic Oils

Which undergo precisely the same Changes as the Animal. The London College directs us to distill Briks which have been cimmered red hot in the Empyr: Oils. The Briks serve the same Purpose as Calcarious Earth or Quicklime.

Of Essential Oils.

Essential Oils are obtained chiefly
from vegitable, tho Castor & Musk
which are Animal Substances con-
-tain an Essential Oil. They generally
retain the Odour, and Medical virtues
of the Subjects from which they are ob-
-tained, which distinguishes them from
the Impregnated Expressed. from y
Latter they may also be known by their
Solubility in Ardent Spirits. -

They may be obtained either by Distilla
-tion w: water, or in some vegitables
by Expression alone. -

all vegitables contain more or less
of Essential Oils, and this also predominates

Of Essential Oils

in particular parts of vegetables, as the Root, Bark, Body, Leaves, Flower. Fruit Seed &c, and at certain periods of vegetation each of these parts contain the greatest proportion of Oil &c: Nature intends to sustain thereon. for when Plants begin to vegitate, the Sap precipitated in winter to y Roots rises gradation to the Trunk. Branches Leaves &c. Therefore whatever part of any vegitable we employ for Obtaining Essential Oils, let it collected at the point of full maturity. The Texture of the Subject when chosen must be

Essential Oils

entirely & minutely broken down
by Picture, or otherwise according to
size of the parts. and in Distillation
= on the following Analasis of
Vegitables generally takes place.
1st
1: a Phlegm rises.
2nd
2: an Oil —
3rd
3: the Remainder rises in form of a
pure Oil which turns darker darker
in proportion to the Duration of the
Proc[illegible]. a Char remains in the
Retort which in Calcination yeilds
Earth & fixt Alkali. in this Proc[illegible] large
Refrigeratories must be employed and
the Subject matter dried before Distillation

Essential Oils

File the water hath penetrated thro it.

If we suffer the subject matter to lie at the Bottom of our Cupels they will burn as it is called, therefore we must use Agitation till it boils. The motion then excited will be sufficient to susp: tend the matters.

Water is added as a Vadium for Re-
gulating the Heat. But it is soon covered
with Oil which excludes Air from its Sur-
face, and by that means renders it
so fixt as to bear a Degree of Heat in wch
some Oils will be rendered Empyreumatic.

The Oils when obtained must be kept in
close Vessels, for in the Air they suffer

Essential Oils

a Dissipation, and thereby lose their Fluidity and Odour. —

Dr. Boerhaave supposed y^e^: all the active power of Vegitables depended upon a subtile Volatile Oil which he called Spiritus Rector: because Ʒi of Cinnamon in Distillation, after yielding Ʒij of Oil becomes a Caput mortuum. This Oil may also be rendered inert by dissipating a few Grains of its weight. The Hypothesis however Specious it appears at first seems to be groundless, since all ye properties of the Subject may be restored by a second

Of Essential Oils

The Distillation w: pure water alone.

Essential Oils unite w: Acids generating
Heat. and w: the Nitrous they frequently
break out in actual Flame. Mr Geoffroy
found that a Combination of ℥ Nitri ol:
and Nitrous Acids would inflame all the
Essential & Empyreumatic Oils, and
most of the Inspissated. Mr Ruelle has
since produced the same Effects with
the Nitrous Alone, under a particular
management. They unite w: Alkalies
forming Soaps. They unite w: all Nitrous
Inflammables. — w: Sulphur forming Bals:
of Sulphur: — w: Alcohol generating Cold. —

Essential Oils

They dissolve Lead and its Calx, & act
weakly on Iron, and Copper. They
refuse all union with Earths. Their menst.
2ℓ
w: water is very perfect as we may ob-
-serve in the distilled waters of mint. &c
-ces &c &c w: ℥ss no thing but Comm.
water impregnated w: ℥ss Essential Oils.

Of Camphire.

This is a Substance of a very peculiar nature; but several Circumstances determine us to refer it to the Head of Essential Oils. like them it is soluble in the cellular Substance of a particular vegitable, and may be extracted by the same means. it forms fair white Concretions. some Essential Oils forming like Concretions have been called by the Chemists Camphires. but the Difference between them is very remarkable, thus Oils generate very violent Effervescence Heat, & sometimes Inflamation

Of Camphire

with Acids. Whereas Camphire generates
Oils Heat, & Effervescence & never inflam-
the
w: Acids. Essential Oils do after Decom-
=position in the Fire: Camphire de-
=lines without Decomposition. Essen-
=tial Oils are destroyed irrecoverably by
Acid: Camphire dissolved in Acids
may be precipitated by water. if Nitrous Acid
be added in a dilute State to Camphire,
it dissolves it only to an Oils Swims
on its Surface. —

Balsams & Resins

Essential Oils exposed for some time to
the Air assume the Name & Appearance of
Balsams or Resins. These contain more
Oil than Oils to which perhaps their
Rich Consistence is owing. Their Solubility
in Alcohol renders Alum very useful for
the various purposes of Varnishing.

Fossile Oil

There is properly but One Species of this called Naphtha. When it is pure it is limpid and thin, laying aside both Propor: this in proportion to its Impurity: it is generally found flowing from the Bowels of the Surface of Springs. Asphaltum, Bitumen Judaicum, Pit: Coal &c all afford Naphtha in Dis: tillation: therefore Naphtha & Sulphur must be the Bases of Inflammability of all fossil Substances. to Strengthen this Hypothesis, let us observe that from

Petrolium Oil

the Tops of many Mountains, as those of Modena in Italy a Naphtha continually flows. this gradually in its Descent turns thicker, and more heterogeneous; forming in its passage Petroleum, Asphaltum Bitumen Judaicum, and at last Common Pit-coal. —

Amber & Ambergrease

Tho they appear different from Petrole Oil: yet in Distillation they give a perfect Naphtha & Vitriolic Acid. Ambergrease is distinguished by a very fragrant Odour. - Amber resists the Force of Saline Menstruums

But in Distillations yields 1ˢᵗ: water 2ⁿᵈ:
water and Acid 3ʳᵈ: dry Salt. 4th: a Fossile
Oil. The Residuum dissolved in rectified
Oils becomes a fine varnish. —

Of Soaps.

The term Soap has been applied to all
Combinations of Oil w: Saline matters.
The Combination of neutral Oils is
only temporary, a Separation very soon
succeeding their Union. The term is only
proper for Combinations of Alkali Oils.
Soaps may be composed of all ye different
Oils; yet the Refined are most commonly
used. Some have preferred the use of Fossile

Soaps

Alkali for making Soaps because ℈ Soaps
brot from the Mediterranean / where ℈ fossile
Alkali is employed / are better than those
of other Countries. This however seems to
depend upon the fresh veg: Oils w: the
People of the Countries near ℈ Mediter.n
are able to procure. for we find by Exper.
riment that Fossil and veg: Alkalies of
equal purity produce with the same Oils Soaps
exactly similar. The Alkali employed
must be in a Caustic State, & ℈ London College
direct us to dilute it w: water till a ℔
Pint of the Ley weighs only 16½ Z. – this
will do for most Oils. but a much stronger

Of Soaps

Ley will be required for the solution of
the oils of Fish, &c. are generally used
for our soft soaps. The Ley & Oil being
combined, we must subject the mass to
gentle heat &c: considerable agitation
till a clear gelatinous substance is pro-
-duced. This mass may be formed into con-
-crete Cakes, by the addition of a sum-
-cient Salt to seperate its water. a portion
of the Salt always unites &c: the Soap &c:
renders it an improper Medicine in some
Cases as in the Lithontriptic, and hurts its
purging Quality. Soap may however
be freed from Common Salt by dissolving it

Soaps

in Alcohol, when the Soap will be preci=
:pitated. The Alcohol may be recovered by
Distillation, and the Soap remain very
pure. — This I must observe is a very com=
:mon practice. The Heat employed in the Ordi=
:nary process for making Soap is not hurt=
:ful. Mr: Geoffroy among many others
was of the contrary Opinion. He therefore
proposes that we should make Soap by
Agitation, and a sufficient caustic Alkali,
without the Application of Heat. but we
object to this Proposal that the time requi=
:red for a sufficient union of the Oil & Alk:
would render the former rancescent, and

Consequently render it useless for the purpo:
=ses of Medicine.

Soap is liable to Decomposition when expo:
=sed to the Air. Therefore when it is to be
used as a Medicine alle Sh: be previously
taken of & w: ch has been corroded by the Air.
For this Reason also a great number of
Soaps Sh: never be made at a time.

Does this Decomposition depend upon
the Absorbtion of an Acid or Impurities
Air? — Soaps may also be decomposed
by Acids separate or combined w: ch Water
Matters. The Oil obtained by y Decomps:
=ition is [illegible] Soluble
[illegible]

Soaps

in Ardent Spirits. Maquer; Thorn con-
cerning this Subject is sufficiently probable,
for which I refer you to his work. The first
is also partly converted into a volatile Alk:
ey: by the Addition of Vitriolic Acid to
Soap I get a portion of Vitriolic Ammo-
niac, w: the Vitriolated Tartar. as these
is very generally a peculiar kind of an
Acid present in the Stomach, Soaps taken
when taken as a Medicine commonly in
Consequence of a Decomposition." —

Sulphur

The second Species of Inflammables is Sulphur a concrete friable mass, not Soluble in Acids, water or Alcohol. all Mr: L: as found in Combination wh Sulphur except Gold, Zinc, and perhaps Platina. Arsenic affords it most plentifully, and it is y Opinion of some Naturalists that these two either Separate or in Conjunction mineralize all the Mr: I found in a State of Ore. When a small proportion of Sulphur is combined wh Arsenic, the Compound is called Orpiment. when a very large Proportion it is called Landanetha. Sulphur is frequently found native in

Sulphur

the Earth. but the most common way
of obtaining it is from Pyrites by Eliqua=
tion. it is afterwards purified by Sublima=
tion, & collected in a powdery form called
Flowers of Sulphur. —

Sulphur may be artificially produced by
a Deflagration of Charcoal w: any Neutral
Salt containing Vitriolic Acid, for in Con=
=sequence of Deflagration a Hepar Sulphuris
will be produced from which pure Sulphur
may be precipitated by any of the Acids.

Vitriolic Acid and Lead forms a Metallic
Salt from which Sulphur may be obtained
by Distillation. ℔ Sublimation. it
may also be produced by Distillation w:

Sulphur

Vitriolic Acid & Oils, or entire vegitables which contain Oils. This last fact ex-
- plodes the Opinion of some who have
not that Opium was the only vegi:
- table matter from which Sulphur could
be extracted by this means, and that some
most of its Virtues were derived. It may
also be obtained by adding ⊖ to al:
- chohol. Thus we see: Sulphur may
be formed by adding its Acid to either of the
Other Species of Inflammable. Is not
this favourable to the Opinion of one
Universal Phlogiston? -
Sulphur may be decomposed by Fire.

Of Sulphur

The Acid of the Sulphur is also in some measure decomposed by exposing to the Air.
and if united w:th Filings of Iron breaks out
into actual Flame. it sublimes entire
without Leaving any Residuum.

Sulphur is not dissolved even by the
most concentrated Vitriolic Acid. it is soluble
in Alkalies forming w:th the fixt Alcaline
Salts w:th Sulphur is much of y:e nature of
Soap. It is Soluble in water & Alcohol. its
Solubility in the latter gives Rise to the
Tinctures of Sulphur, and we include under
this Head w:h are called Tinctures of Antimony
& other Metallic Substances, for it is certain
that the Metallic part of these are no way

Of Sulphur

affected by Alcohol. - Hepar Sulphuris
is a very powerful menstruum for m.d: it
even acts upon Gold so far as to render it
soluble in water. The Matter precipitated
from Hepar Sulphuris by the Addition
of an Acid is called Lac Sulphuris. The
Fumes of Hepar Sulphuris turn $\frac{2}{4}$ White
Metals of a black Colour. Letter wrote
the
w: a Solution of Lead or Silver will dye
do not stain the Paper; but if applied to
the Fumes of Hepar Sulphuris immediately
become legible.

Sulphur distilled w: Sal Ammoniac and
Quicklime gives a Liquor strongly im-
-pregnated w: Sulphur La Vol: Alkali w:o

Of Sulphur

called Tinct: volat: Sulph: Hoffmanni.
Quick silver added to this Tincture forms
Cinnabar. —

℞
Sulphur unites w: all Oils into Balsams
entirely changing their Properties. it does
℞
not in a perfect State unite w: Alcohol. —

It has a great affinity to Metals:
℞ ℞
so y: Chemists in all Ages have supposed y: a
pure Elementary Sulphur entered into the
Composition of all Metal: Substances.

In a Separate State it has no Effect
upon Earthy Bodies, but in the form of
Hepar Sulphuris proves a powerful flux
to them. —

Of Alchohol

Alchohol, Spirit of wine or Ardent

Spirits is produced by art from a parti-
=cular Fermentation of vegitable Juice
only. The term Fermentation was form-
=ly applied to the Production of Alchohol
alone, But as later Chemists have en-
=larged its Signification it will not be
improper to speak of Fermentation in
general, and then describe each parti-
=cular Species.

Of Fermentation.

If in any mass of matter an Intestine
motion arises, wh is propagated thro
the whole till it becomes homogenous

# of Fermentation

and if a portion of this matter being added to a Quantity of Fresh, the latter is assimilated, and becomes also homogeneous, such matters are said to be in a State of Fermentation, and ye matter added is called a Ferment. ye Maturation of the Fruit, Seed, &c of Vegitables, and the Rancescency of Oils seems to be owing to peculiar Fermentations. The Diseases of Animals and Vegitables sometimes depend upon Fermentation excited by a Ferment. Thus in Inoculation for the Small Pox the little portion of Variolous matter added assimilates the whole Fluids of a sound Animal Body, & thereby induces ye Disorder

Of Fermentation

Again if an Ear of Wheat affected w: the Smutt be applied to Barley it most vigorous State, the latter will soon receive the Infection, & communicate it to the next contiguous, & so on: in this way the Fermentation may be propagated ad Infinitum. —

Fermentation is divided into the Vinous w: produces Ardent Spirits, the Acetous w: produces an Acid - and the Putrefactive by which a Vol: Alk: may be obtained. The first of these is w: belongs to our present purpose, and we shall therefore confine Ourselves chiefly to it.

Vinous Fermentation

This takes place only in vegitable Juices, and more or less in these according to the quantity of Saccharine Matter which they contain. When all this matter is extracted from any Veg: Substance it becomes incapable of Fermentation. From this it appears that Vinous Fermentation cannot take place without presence of Saccharine Juice. — The Ancients thought all vegitables were capable of this Fermentation, but we find that the very acid bitter or aromatic plants are not only themselves incapable of this Fermenta: but they prove to be powerful Antiseptics

Of Vinous Fermentation

Dr Boerhaave ~~de~~ distin:

= guishes the plants incapable of Fermen.

= tation into Alcalescent & Rancent.

Among the Vegitables w: are proper

Subjects of Fermentation, some contain

in their Juice a Sugar prepared by Na.

= ture which runs Spontaneously into

Fermentation. Others require Artificial

Means to evolve their Saccharine matter Such

as the farinaceous Seeds of Plants. Liquors

Produced from the former kind are called

Wines; those Obtained from y latter

~~Are~~ are called Ales or Malt Liquors.

The Juice of the Vine is a Subject y:

Of vinous Fermentation.

Most commonly, and w.th the greatest advantage employed for the making wines of any kind whatsoever. The Saccharine Juice when first expressed is called must. This must be diluted w.th two or three times its own weight of water, and exposed for sometimes to the air in open vessels which must be kept as much at rest as possible. The matter in this State is turbid, more viscid than water, sweet & sweet to the Taste having no peculiar Odour. After it has remained some days air Bubbles begin to appear w.th a hissing very elastic noise called after Aquæ provenssum. This causes an Intestine motion attended w.th some Heat & Intumescence. These Bubbles arising at

Vinous Fermentation

the Surface are there entangled, by the
viscidity of the Liquor, & at length the forma-
tion of the Liquor, & at length the forma-
tion. from this a vapour is exhaled
which affects Animals viz. Giddiness &
Palsy, - extinguishes Flame, and renders
Caustic Alkali mild. during the process
Earthy matters are precipitated to y Bottom
— we must then divide the Liquor viz. the
Stand. and if the seperated portions do not
remain perfectly at rest, but discover the
least tendency to unite, we may conclude
that the Fermentation is not sufficiently
perfect. After these Appearances y Liquor
becomes transparent. & void of Viscidity, ac-
-quires a pungent taste & grateful Odour,

Vinous Fermentation

assumes the Title of Wine from which Al-
:chohol may be produced by simple Distilla-
:tion. We must secure it in Bottles, where
in Order to its becoming Wholsome Drink
it must undergo Another slow & long
Fermentation. The following Circumstances
must be Observed for exhibiting ye Fermen-
:tation, first the proper Fluidity of ye Liquor
2:^nly the proper Application of Heat 3:^d the
Communication w:^th ye Atmosphere: by ye un-
:disturbed State of the Vessels. —

As to the I:^st or Sobrall Observe y^t Sugar
is a Salt w:^ch in its dry concrete Form is So-
luble in Water & Alchohol, very inflamma-
ble, and not only incapable of Fermentation,

Of Vinous Fermentation.

but is really one of the most powerful
Antizeumicks we have. When it is
diluted w: ½ of water the mixture is
called a Syrup, which also resists Fermen
-tation. on the contrary if the Liquor
be too dilute, the Air Bubbles arising
in Fermentation will not be sufficiently
inviscated, and an first account will es:
-plode and discharge a matter & Reabsorption
of which seems absolutely necessary for ye
production of wine. The most general
practice is to procure the Liquor of such
viscidity as exactly to bear a new laid Eg:
— perhaps a still greater Dilution will

Various Fermentation

not the case proper: Observing at the same time
that much greater Visidity is required in
hot than in cold Climates. The best
proportion for home made wines is 5 parts
of water, and 3 of Sugar & Fruits as Currants &c.
It
II: The lowest Heat at w: Vinous
Fermentation takes place is 42°: and
if the Heat be encreased to 80°: an Evapo:
:ration of the Liquor will be produced. Dr:
Boerhaave imagined that the best Degree
of Heat is between 60° & 70°., But the fi:
:nest Wines seem to be produced in Temp:
:ratures between 50°: and 60°. The intense
Heat of the torrid Zone is the Reason why
no good Wines are produced in Countries,

exposed to its Influence.

III.ly We may by Digestion produce some small Degree of Fermentation in Vacuo. but for Access of the Atmosphere is requisite for rendering the Vinous complete. —

IV.ly The Rest of the Impediments tributes much to the Formation of Wine, for by Agitation the necessary Formation of Crust on the Surface will be prevented; & the precipitated Lees be raised up which never fails to renew the Fermentation.

All Attempts to establish a Theory of Fermentation have as yet proved

Vinous Fermentation

It is generally Allowed to depend upon a
Resolution and a certain Reunion of the
parts of Saccharine matter. These Phænom:
may also depend upon the Introduction
of some new Matter into the Subject, or
upon y: Dissipation of some heterogeneous
matter from it during the Fermentation.
We can determine w: some certainty:
a Resolution of the Saccharine matter takes
place. That the matter first liberated is
an Acid appears from the Taste which
the Subject matter acquires, and from y:
Power w: all Bodies that Absorb Acid ex-
-ert in checking Fermentation. Another

Vinous Fermentation

Matter separated in an Elastic Menstruum

as Asphaeas from its Effects in killing Animals

– extinguishing Flame, & in reducing Caustic

Alkalies to a mild State. We know very little

about ye Action parts of the Operation.

That the production of Alcohol

depends upon a Reunion, & Reabsorption

of the parts separated, Asphaeas very probable

from its total absence when y^e menstruum

Air exhales from too great Liquidity or

Agitation of the Liquor, or when y^e Acid

is by any means involved as soon as it is

extricated. We are hence led to conclude y^t

the chief Properties of Alcohol depend upon

Vinous Fermentation

an Acid and Inflammable Air. we may Ob=
=serve also that the Inflammability of alc
Bodies seems principally to the Effect of
an Acid and Inflammable Air, Whence it is not
improbable to suppose that the 3 forms
of Inflammables depend upon a simple
Phlogiston formed of these two Matters
combined in different proportions, or y:
in Alcohol there is the greatest proport:=
=on of Inflammable Air, that in Oils y^e Acid
predominates, & y: in Sulphur it predo=
=minates still more. —

In both the first & second Vinous Fer=
=mentations we apt to proceed too far, we

Vinous Fermentation

must prevent it by the addition of some
matter which resist Fermentation.

Of these none is more powerful than
Sulphur, so that must may be preserved
many months in Casks smoked w: Sulphur
without any Appearance of Fermentation.
& for this purpose it is employed by the
Wine makers. it is hard to say how the
Sulphurous acts. we know y during Inflam:
= mation it affords an Acid and a Mattew:
in all probability is Sulphitic Acid. the lat:
= ter whatever it be seems to act most
powerfully as an Antiseptic, since it
very
requires a large proportion of Acid to pro:
= duce

Vinous Fermentation

Effects which may be produced from a given Quantity of Sulphur. Fermentation is frequently ~~checked~~ by the Approach of Thunder Storms. as this happens sometimes without any considerable Explosion it is not improbable to suppose that it is the Effect of Electrical matter: which the Air at that time is greatly impregnated. if this Theory should be found true, it will be unfavourable to ~~my~~ Opinion of an Acid residing in Electrical matter.

Acids. Alkaline Salts - Absorbent Earths - Neutral Salts - Metals - Alcohol - Animal Mucilages, the most noted of w:

Vinous Fermentation

Are Whites of Eggs - Oils - Resinous Bodies
- Bitter and Aromatic plants - Chiefly
of Wood &c are all Antizeumics and
most of them are used as such. Alkalis
seem to act by preventing the Evolution
of fixt Air, or Absorbing the Acid as it
is extricated. Absorbent Earths probably
act in the same manner tho they differ
as being promoters of the Putrefactive
Fermentation. Animal Matters act
perhaps only by entangling the flea-
ting particles wch would renew
the Fermentation. The Italians cover
the Surface of their wines wth Oil, chiefly

Vinous Fermentation

for excluding Air as we employ Corks.

- The Resinous Chips & Shavings seem to act partly by their oily properties, and partly by absorbing the first Air & Acid when evolved.

The three forms of Fermentation due: ced each Attenuis a very regular and undeniable progression. if therefore we desire to reduce a Subject to any particular form: & of the Saccharine Matter, we might effect: by exhibiting the Yeast by adding some Body as Absorbent Earth to prevent q^t Vinous & Acetous. —

We have observed q^t Wines are not fit for drinking till they have undergone a

Vinous Fermentation.

a Second Fermentation. This sometimes
is very suddenly and entirely stopped.
- the Liquor then becomes vapid and
ropy, inclining to putrefaction. the
Causes of this Disease may be 1st: Prema-
turity of the Fruit employed; 2nd: the
Presence of some Antiseptic Substance,
- too languid Fermentation at first, by
which the whole of the Must is not prop-
-erly assimilated, or on the contrary 3rd:
by too active a Fermentation which
dissipates the parts evolved & prevents their
Reunion. or 4th: too great a Degree of
Cold, which may precipitate parts keeping
Solution during the usual Temperature

Vinous Fermentation

of the Air. We must remedy this Disease by exciting a new Fermentation which may be effected by the addition of a fresh Ferment, such as lees - by Stirring up lees or if these have become inactive by adding the fresh Lees of other wine. or it may be sometimes produced by the Application of Heat.

In the second Disorder to which wines are liable they become thin & sour. this cause of this may be a second Fermentation too actively renewed. — the Approaching Warmth of Summer — transportation on Ship Board — a Continuance in Cellers near the Streets of populous Cities, or any

Vinous Fermentation

After Means whereby they are subjected to frequent Agitation. — Upon this Au-
=thor Chaptal & Portugese add Alcohol to their Wines before Transporta-
=tion.

Qualities of different Wines.

The newer the Wine is, the greater Abun-
=dance of Flowering when poured into a Glass and vice versa. Wines are strong or weak in proportion to the Quantity of Alcohol — sweet or sharp in proportion to the Quantity of Saccharine matter they contain.

Italian Wines are made sweet gen-
=erally by checking the first Fermentation.

Qualities of different wines.

This however differs when taken to ferment in the Stomach.

The luscious taste of Tokay wines depends upon the sweetness and perfect maturity of the Grapes from wh: they are produced.

Rhenish wines are obtained from acid Grapes — hence their sharp taste. — Wines are made rough by mixing the Stalks of Grapes, or by pressing them when unripe.

Those which are called Virgin wine are obtained by a gentle expression of very ripe Grapes. Wines of a proportionally inferior Quality may be produced by a second or third Extraction. —

Botanists agree: there is only one species of the Grapes; and yet these different

Of the Qualities of Wine

Changes under w: they appear owing to the Soil, Culture, Climate - Juice &c. These Changes however are permanent & considerable that a proper Choice of them for producing different wines is extremely necessary. —

The Proprietors of Vineyards never use the Fruit of a Vine which is more than 15 Years old. from y: Age to 100 it is that to be in a State of Improvement. The full maturity of the Fruit is that such a necessary Circumstance for y: production of delicious Wines, that y: people of Burgundy are restrained by the Law from plucking their Grapes 'till a Magistrate has proclaimed them fully ripe. —

Of the Qualities of wines

A chalky or gravelly soil on ye Southern side of a hill is extremely favourable to the Growth, and perfection of the vine. —

Of Malt Liquors.

These are produced from the Cerelia, or farinaceous Seeds more particularly Barley. they differ from wines in being produced from Vegitables that require an Artificial process for evolving their Saccharine matter. —

Of Malting

On the Conversion of Grain into Malt, or in other words the Evolution of its Saccharine matter, is only the progress of Germination; let us first consider in w: manner nature

carries on this work. —

Seeds when carefully examined are
found to contain two distinct parts,
viz: the Radicle or Root, and ye Plume
or Plumule of the Plant. When ye Seeds
properly supplied w: moisture ye radicle
& plumous parts begin to germinate,
each tending to opposite Extremities of the
Seed. in Consequence of the Germination a
Quantity of Saccharine matter is evolved. this
encreases till the parts arrive at their
respective Ends; but after they have been
broke thro' the Husk the production of Sa-
-ccharine matter is opposed. these circum-
-stances must be carefully observed in
conducting the Operation. — The Barley

Malting

must be macerated in water for a Suf-
-ficient time. we must then expose it
in thin Layers to dry. it must be often
turned over to prevent Putrefaction, and
to expose every part equally to the Air.
when the Grains are sufficiently malted, they
must be dried in Kilns made for y Purpose.
the Less employed the better: smoke as little as
possible. Quick drying leaves the malt
tender and pervious, yet Carefully Late-
-hen not to give it an Empyreuma. Too
-Tedious slow Drying in the Air renders
the malt tough, and almost reduces it to its
Original Farinaceous State. When the
Grain becomes very sweet, and y Plume

of Mating

is just ready to issue from the Lobe of the Lud, we may reckon the Malting perfect. —

The Grain thus prepared is to be broke down in Mills contrived for y^t purpose, & then ye Saccharine Matters is to be extracted by Infusion in water. This is called Mash-ing. This would be greatly expedited by the Application of boiling water, but that heat would suddenly abolish will coagulate the Malt, so y^t we sh^d be careful to apply the heat gently. Thus it must stand ½ hill a considerably strong Tincture is extracted called Wort. if this is kept too long it will run into an Acetous Fermentation wh in England is called Foxing in Scotland Blinking.

Malting

The same Malt may be infused several times to extract all its Saccharine Matter, and to prevent the Fermentation y^t w^d take place if an excession of water continued too long.

These several Extractions are to be inspissated by boiling for giving a stronger Liquor. - Perhaps boiling serves no other purpose, since the wort obtained by means of cold water affords a Liquor equal in every Respect but Strength, to y^e ½ of the concentrated wort. I must observe however in the wort boiling we often see fibrous Filaments floating. if these are the Saccharine parts of the Grain remaining in the wort, & which are

Of Mashing

coagulated by the Heat as some imagine,
the Boiling certainly contributes much
to its Inspissation. When the Liquor is
sufficiently boiled, it must be cooled rap-
-idly in large shallow Vessels. After this
it must be subjected to a vinous Fermen-
-tation, which is to be promoted by Yeast,
or some other Ferment. —

Ales are extremely disposed to acetous
Fermentation, that it is always necessary
to add some Antizeumic Substance. Of
the Vegitables Hops are most generally
employed for the purpose, not only be-
-cause they powerfully resist Fermenta-
-tion, but likewise on account of their agreable

Of Malting

Bitter taste wch May contract to ℔ Liquor. ℔
℔ Malt employed in extracting ℔ Bitter of
the Hops, the more agreable is the Taste of
it, for in the common Method of boiling
the Aromatic Bitter of the Vegitable is
changed for Acrimony: is disagreably Styptic
to the ℔ Heavy on the Stomach; the Flavour of
the Hops therefore would be more Innate.
ly preserved by Gentle Infusion: but as
this practice would be attended w^h a great
Expence of Hops, it will probably always
be neglected by Tradesmen.

Ales are Subject to all the Diseases in-
cident to Wines, and are to be remidied by
the same Means.

Distillation of Alchohol from Liquids.

Alchohol being more volatile than the other parts of Wine & Ale, may be obtained from them by simple Distillation for this purpose the Liquor must be employed at its most perfect state of Fermentation. viz the Conduct of the Distillation great Care is necessary to prevent Inconveniencies, viz: the Liquor very readily contracts either from a peculiar Oil which it contains or from the Contact of the Lees, or other subsiding matter viz: the Bottom of the Vessel. These Inconveniencies are to be obviated 1st: by Agitating the Liquor till it boils for the Separation of the Feculæ 2nd: By bringing on the Boiling as soon as possible, and

Distillation of Alcohol

Alcohol by preserving a very equal Degree
of Heat. Besides the Empyreuma which
may arise from too much Heat applied,
the Vapour may be driven thro' the
Refrigerating Tube without being con=
densed. This by the working is called
a Blowing of the Still. We cannot here
avail ourselves of the common boiling
point of water for regulating the Heat,
because the Still acting in some measure
as a Digestor, encreases the Heavity of the
water.

In the first part of the Distillation un=
til comes over — Pure Alcohol unmixed
diluted w: Water — and if the Vessels is

Distillation of Alcohol.

carried on too long, an acid & Empyreuma-
-tic Oil arise. - Notwithstanding all possible
precaution the Alcohol obtained by a
first Distillation will be impregnated with
an Empyreumatic Oil. This may be
-liminated by rectified Distillations with water,
but the two chemical finding many Distilla-
=tions considerably expensive, make use
of Acids or Alkalies for concealing the
Empyreuma. Acids are to be preferred
because they give the Spirit a very agree-
=ble taste. —

The Quantity of Alcohol yielded is some-
-what in proportion to the Quantity of
Saccharine matter contained, and by

Distillation of Alchohol

Activity of the first Fermentation, which
is generally most perfect when we employ
the largest Quantity of Malt. —

The Purity of Alchohol may be discovered
by its Burning to Dryness. we may procure
it to be still more pure when it does not act
upon Caustic Alkalies. But the
most accurate Test of by far is the Specific
Gravity w: we must examin After every
Distillation, and when it comes out
the same for One or two Successively, we
may be certain it is in the purest State
possible. —

The Alchohol when Obtained

Distillation of Alchohol

From wine Ale &c is exactly ye same Liquor. the diffirent Odours & Tastes entirely depending upon ye Essential Oils of the several Subjects.

The Addition of water in making Punch decomposes in some measure the Oils of the Spirit, so that we may judge but of thier Odour in that state. Spirits are improved by keeping in wooden Casks because the wood Absorbs their Oil.

Properties of Alchohol

It is the lightest & most volatile fluid known except Ether, and vol: Caustick.

Properties of Alchohol

- It is probably the most inflammable for other tho' it takes fire at a greater Distance, on Acc^t of the vol: fumes ^ex^ it sends off; yet perhaps its Inflammation does not so soon commence upon the sudden Application of Heat. _ it in= flames entire without leaving any Residuum. it will suffer very numerous Distillations without any change, but w^h the Addition of fixt Caustic Alkali it ^la^ gives up an Acid which unites w^h the Alk: into a Salt very much resembling Regenerated Tartar.

Alchohol when Applied to the

Properties of Alcohol

Vitriolic Acid effervesces generating
Heat, and under proper manage-
-ment produces an Ether vitriolic; but
more of this hereafter.

With Nitrous it exhibits more
violent Effervescence & Heat than w: the
Vitriolic Acid, producing likewise
a Nitrous Ether.

Alcohol admits of some union
w: the Muriatic Acid, tho less than w: the
either of the former. its union w: the
Vegitab: Acid is still more imperfect.

Alcohol in its Ordinary Degree
of purity does not unite w: mild

Properties of Alcohol

Alkalies, but w: the caustic forms a
matter which has been much celebra-
: ted by the Chemists, tho its medical
virtues are not properly determined —
The famous Op: 2 vol: Aromat : is com-
: posed of Alcohol, vol: Alk: & Essential
Oil. the various processes described
by Authors for Obtaining this Spirit,
but they are mostly vinegrower. Simple
Digestion is probably the best method:
can be employed. the French Eau de Luce
is nothing but this Spirit Obtained by
Digestion. it dissolves some of the dila-
-gnescent Salts. —
It does not unite w: the 2 Inflamed

Properties of Alkohol

Oils, except when they are united or
=covered from fixt Alkali. it unites w:
the Aetherial Oils in proportion to their Volati-
=ty. Sulphur is not dissolvable in Alkohol
except in the Form of Hepar.

Alkohol unites w: none of ℔ M.S.
Earths or Earthy Salts. it unites w:
Water generating Heat, & diminishing
the Absolute Bulk of the Ingredients
before Mixture, but after a certain
Quantity of Water is added the Heat ces-
=ses to be generated, & the Bulk to be
diminished. it coagulates Animal fluids,
and resists every kind of Fermentation.

Properties of Alchohol

I must here observe that wine converted
by Fermentation into vinegar does not
afford any Alchohol in Distillation alone,
but the addition of M: C: as in the
case of the Sacchar: Saturn: & we may
readily obtain a large proportion. Do
the M: C: here evolve an Alchohol w:
was before latent in the vinegar? or do
they contribute to a new production of
Alchohol by restoring ℓ^4 principles
w: has been dissipated in ℓ^4 vinous
Fermentation? — I own ℓ^4 + ℓ^4 former
opinion is most probable, since we find
that very highly concentrated vinegar

Properties of Alkohol

is capable of Inflammation.

Ether

This was known to the Ancient Chemist.
but never came into great Reputati:
-on till About Sixty years ago. When
Frobenius Invented an Ether to the
Royal Society w. the Process for mak:
-king it, giving Directions at ye same
time, that it Sh^d not be Aired till
after his Death.

Before that time however two French
Chemists discovered the Method of making
it. We have since had various Me:
-thods described; but the most simple

Of Ether

easy and the fast method is the follow-

:ing. ——

The Vitriolic Acid & Alcohol must

be taken as pure as possible, in the

proportion of 2 parts of the latter, to one

of the former. We must then put the

Alcohol into a Retort, and add the

Acid very gradually, stopping on the

Brisk after each addition, & observing

not to add a second portion 'till the

Heat produced by the first has entirely

subsided, for otherwise we shall ha-

:zard a violent Effervescence & Explosion.

— When the Acid is put in first it often

Of Ether

remains at the Bottom without Ether.
=versumed; in this Case we must re
Agitation.

When the Mixture is thus made
a Receiver must be luted on as close
as possible. it must then be raised by
Heat quickly to a very gentle Ebullition,
and after 1/2 an equal Degree of Fire must
be preserved. in the Course of this
Distillation various Matters come
over. 1st Alcohol alone. 2nd a deliquid
Spirit 3d Ether 4th volatile Vitriolic
Acid, & lastly a more oily Ether called
Oleum dulce. the matter left in the
Retort now becomes black & thick.

Ether.

If the work is continued longer Bubbles
will begin to appear, as soon as these
are seen the Distillation must be stopped,
or such an Intermixture will immediately
ensue, as will force the matter into the
Receiver. To separate the Ether from
these several matters, we must first
pour on a quantity of water. The Ether
w: a portion of Acid adhering will rise
to the Surface immediately. it must then
be poured off by a proper Seperating
Cock, and to it we must add a weak
solution of Alkali and water w: will per-
fectly separate the Acid, and leave the
pure Ether on the Surface of the water.

Of Ether

If by this means the Ether should not be sufficiently pure, we may dis-
-just the whole to a second Distillati-
-on when the Ether will rise first with
a small quantity of Alkali adhering. we
must then stop the work, and add to y^e^ matter
a portion of clear water which will pursue
= ly separate the Alcohol. more Ether
may be obtained by adding fresh Alko-
= hol to the matter in the Retort. -

Properties of Ether.

a Slip of paper dipped in
Ether will take Fire at some Distance
from the Flame of a Candle. this is

a great proof of its volatility & inflam:
:mability; yet it does not possess y^e latter
property so perfectly as Alcohol. It vo:
:latilizes under the Receiver of an Air
pump, leaving an Acid Residuum. -
When extremely pure, a drop will exhale
in falling a few Feet thro the Air. ïthas
been already supposed that if this will
burn under water, because when burnt
is found upon flaming Ether, it is ime:
-diately buoyed to the Surface without
the Extinction of its Flame.

It unites w: Acids effervescing and
emitting copious Fumes. it bears a
Relation to Caustic Alkali like Ether Caustic

matters. It is by no means such a powerful Menstruum for Oily matters as some have supposed. it extracts the Fats imperfectly, but much less powerfully by the Smell and Colour of Aromatic Oils containing Essential Oil. it does not unite with Salts or Metals. —

If to a Solution of Gold in Aqua Regia Diluted w: water, a Quantity of Ether be added, the Gold will be immediately seperated and suspended by y Ether in its pure Metallic State. this happens with Essential Oils & Alchohol. Camphire is said to mention another Phenomenon

Properties of Ether

with Respect to Gold, that when fused

together w: various Ether Metals, it al-

: ways rises to the Surface. — on what

principles do these Phænomena depend?

— for a fuller Acc: of Ether as Menstruums

& Instruments. —

Alcohol moderately impregnated

w: Vitriolic Acid gives the — —

Spiritus Dulcis.

This was formerly obtained by Diges-

tion, but is this way the Invention is

not perfect. We are Instructed directly

by the Lond: Coll: to practise Distillation

w: equal parts of the Ingredients, &

by the Edin: Coll: w: only $\frac{1}{8}$ of y^e^ Acid.

~~Spiritus Dulcis~~

Spiritus Dulcis

In the latter the quantity of Liquid dimi-
-ished is not sufficient, in y^e former it
superabounds. so that we must red.
-till it w: y^e Addition of an Alkohol.
The Ol: Dulc: wch arises in y^e Distillation
of Ether, forms wth Alkohol w^t is called
by Hoffman, Liquor Anodynus Mineralis.
Alkohol unites w: ye nitrous Acid,
exhibiting the same Phenomena as y^e
Nitri olii, Only in a greater Degree &
forming an ~~Alcohol~~ Ether which
differs somewhat from ye forgoing
in Odour and Colour. This is to be
obtained by Digestion only. for the

Properties of Alcohol

violent Effervescence renders a Distil-
lation impracticable. — at any Rate
it is extremely dangerous to use a
concentrated Acid. We must therefore
dilute it w: an equal Quantity of Water.
— This must be added to an equal Quan-
tity of Alcohol in the following Man-
ner. First put the Acid into a Phial or
Matrass. Then cautiously pour on
the Alcohol w: will float upon the
Surface of the Acid. close the Aperture
of the Vessel as accurately as possible.
The Mixture must be performed slowly.
And the Vessel closed w: the utmost Ex-
actness.

Properties of Alchohol.

Winter is the most proper time for this
Practise. But at w: ever season it is
carried on we must have it in y: coolest
place, and as perfectly at Rest as we
can Able. The Liquor at different times
must be very gently moved, and this is
to be done 'till no Bubbles appear upon
shaking the mixture. The Oyl will
be collected on the Surface. —

Alchohol admits of a Combina-
=tion w: Muriatic Acid, tho' not Sulphu-
=ric nor to force an Oyl. —
An union w: Nitric Acid is still
more
Sulphur.

Having now furnished y^e Three

General forms of Inflammables.

we might reasonably enquire whether there are any more in Nature? - I could rather say there are such Mean determine w: they are. The Inflammable Matter of Charcoal seems to be of a peculiar kind. It: O: also seem to have a peculiar Inflammable Quality, since all of them except Gold and Silver will burn away in a sufficient Heat. This may be attributed to the Acid w: they contain, but Lime ch: ists whose Composition no Acid enters is very inflammable. ——

Metallic Substances.

There is no part of Chemical Knowledge more deficient than y: of Metals. all the Traditions we have had from an-cient times as fallacious & inaccurate. Those among them who were dabbling in the Art, kept their Discoveries Stri&-ctly secret. — in later Days few have studied the Doctrine of Metals sufficiently, especially the Chemico-historical part. I shall not then attempt to give you a complete view of the Doctrine of Metals. but only their Relation to Pharmacy & Physic, & a few fundamental Facts y: may

Metallic Substances

I first Wish you in Prosecuting this Study. I
refer You for a Definition of M.S. to the
first part of our Course upon y^e Subject.
M.S. are divided into Metals & Semime=
tals. The distinguishing Characteristicks
malleability, Peculiar Only to the former.
The Names of these are

Gold
Silver
Lead,
Tin
Copper
Iron
Quicksilver.

The last of these has been acknowledge
a Metal ever since the Russian Expe=
riments have proved it malleable. The

Of Metallic Substances

Semimetals are

Zinc,
Antimony,
Bismuth,
Cobalt,
Nikil.

These are all native substances found constantly in the Bowels of the Earth. but before we explain their particular situation, it will be necessary to premise a few Theoretical Remarks concerning the Structure of the Earth. —

Theory of the Earth.

In digging into the Earth we find various Strata which cover it. These Strata seem to be concentric, running

Theory of the Earth

Strictly parallel to, or inclined at a very
small angle w: the Earths Surface. Their
Breadth is frequently extended in a uni-
-form manner, over a vast Tract of
Country. — Their Depth is very inconsi-
-derable w: Respect to their Extent, since
we generally find near two Strata in de-
-scending 200 Fathom below y: common
Surface. The matter of the Strata is ge-
-nerally Earthy or Stony, & sometimes inf-
-lamable. From the Appearances of
these Matters they appear evidently to
have been suspended in a fluid Form, &
from the Shells, and other marine Produc-
-tions found in the Bowels of the Earth

extremely remote from the Sea it is
probable that this Fluid was ye Ocean.
Philosophers have adopted various Theories
to acc^t for these Appearances. Some
think y^t the Earth emerged at ye Creation
in its present Form. Others think y^t the
present form was assumed in Consequence
of the Noaical Flood. all seem to agree
however that the Earth was Once entirely
or partially dissolved in the Ocean, and y^t
the solid parts subsiding from ye Fluid formed
the various Strata. during this Subsidence
it is probable that considerable Cracks or
Fissures frequently happened. the

Theory of the Earth

Appearance of Subterraneous Caverns
seem to favour such a notion; for we mostly
find that the Depressions of one side an-
:swer to the Eminiences of the other.
Mr: Layman a Swedish writer thinks
that he can perceive w: he calls Origi-
:nal Mountains differing in Structure
from the Strata w: surround them. he suppo:
-ses that these Mountains existed before
the Deluge, and that they were never entire
:ly covered w: water. that when the Flood
retired the solid parts subsided in different
Strata in the valleys between them. he
says y: in burrowing a Stratum we often
find it terminating by the Original sides

Theory of the Earth

As he supposes of a Mountain. That
Hoo Mountains are composed chiefly
of Crystalline Matter confusedly blen-
=ded without any regular Strata, and y:
that they never contain any Marine
Production. None of these Theories hap-
=pens can be universally true, since
there are accidental Causes w: must even
since the Deluge have occasioned con-
=siderable Changes in the Structure of
many parts of the Earth. Such are the
violent Eruptions of Subterraneous fire,
or Water bursting from Caverns, or the
continual Falling of Rain which in

Theory of the Earth

a great length of time may produce con-
siderable Effects. To these we may add
Earthquakes, and the continual Action of
the Sea. 2ly it may be said that these
violent Causes do not often act, Yet it
may be demonstrated, that they have
happened very universally in different
Ages.

The waters exhaled from & precipitated
again upon the Earth are replete with
various Matters, many of wch are deposited
during their Filtration thro the Earth.
These Matters combining wth particular
parts of different Strata produce the
various Mineral & Metal. Subs in Nature.
we generally find these in Vertical Fissures

Of Metals.

mentioned before, wch: by the Metallurgists
are called veins. + I do not affirm y^t
Metals are always found in y^e vertical
Fissures, and no where besides, for they
are sometimes disjured between the
Strata, and most frequently in y^e Origi-
=nal Mountains. The veins of Metals
constantly are lined wch: an Earthy Crust
called by the Miners Spars or Spar.
— There is between this Crust, and y^e Metal
a thin Layer of Clay. The Metalline Mat:
=ter is not always continued uniform:
=ly thro the vein, but is often interrup=
=ted by various Substances interspersed,
according to the Strata thro wch: it penetrates.

Of Metals

This strengthens the Opinion of ascertain
something wch exists the formation of dif:
ferent fossils, and m: substances.

Metals are found in the Earth
under four Appearances.
viz
1: in a native or virgin State.
2nd Corroded or dissolved by Acids in the
form of powder, & sometimes Crystals.
3dly in the form of Calces or Precipitates.
I make this Distinction because I am
uncertain whether they assume ye form
by a precipitation from Acids, or by
actual Calcination.
4^thly^ State in wch they are found is that of
2dly One. This happens in Consequence

Of Metals

Of Mineralization by Sulphur or Arsenic

both, or either combined w: an Earthy

or Stony matrix. Chemists & Philosophers

particularly Dr. Haller have endeavoured

to prove that M. S. were generated from

Sulphur and Arsenic, but hitherto in

vain. When Metals are found in a

virgin State w: more rarely have been

any Other, they are generally in a form

of Plants. hence the Term Vegitation.

Of Gold

This Metal is very universally found

in its pure State adhering to an Earthy

Crystalline matrix called Quartz. it

is perhaps never absent from Sand, tho

Of Gold

seldom in such Abundance as to repay
the Labour of extracting it. We are
however led to think that Metals under
some Circumstances have a power of
mineralizing Gold, since Mr. Cronstadt
an Accurate Author says that it is united
often w: Silver, and also in formous y:
There is a Mine in Hungary where Gold
is extremely blended with ye Sulphurious
Ore of Cinnabar, and of another in
Germany which is blended w: Zinc &
Iron. —

Of Silver

It is seldom found in its Virgin State. Often
in a Saline corroded by Muriatic Acid, when

Of Silver

it is called Luna Cornea. but never in a Calciforme State. It is in Ore Mineralized by, and united with Sulphur. Most Metals when united w: Sulphur become friable except Silver which retains Brightness & Ductility. it is frequently disturbed with Copper, Antimony & Lead, but seldom w: Iron. it is sometimes found Mineralized by Arsenic.

Of Lead

It is never in a virgin State as found in the Earth; seldom or perhaps never in the Saline; sometimes in the Calciforme When it is called Spar,

Of Lead

which I have seen a Specimen; and frequently in a State of Ore mineralized by Sulphur, when it is called Galena. it is sometimes dispersed w: Iron & Copper.

Tin

I never found pure. Sometimes it is found corroded into a Crystalline Spar. often Calcifourme & mineralized by Arsenic into a Crystalline & transparent Ore. —

Copper

is seldom in a virgin State; frequently in the Saline, combined w: Vitriolic Acid into blue vitriol; Sometimes in a Calci- -forme State, but most frequently in the forms of an Ore well known by y: name of

Of Copper

Pyrites, ℔: differ acording to the mine-
=ralizing substances. — There may be re-
=duced to three. Copper & Iron, Sulphur
Arsenic. With the 1: of these is formed
the Copper, ℔: the 2: ℔ Sulphurious. ℔: ℔
the 3: Arsenical Pyrites. The Pyrites are
hard, friable and inflammable Bodies. ℞:
external Sur face is usually of a regurally
cubical, or polygonical Shape: inter-
=nally their Structure is in form of Stria
diverging from a Centre. The 2: first
Species are of a deep yellow Colour, the
Arsenical is white; but as these frequently
unite we find Pyrites of intermediate

Of Copper

Degrees of yellow. Naturalist say y: when Pyrites are very hard, & crystalline litte Copper can be extracted, and also w: they disagree in the Air. y Pyrites w: contain the greatest proportion of Copper as those w: have a grumish Cast, or such as when exposed to the Air become covered w: blue and green Efflorescences. - Yellow Ochre is a Mixture of Copper and Earth.

Of Iron.

This Metal has been thot never to ab: - pear in a Virgin State: but some French Naturalists informs us y: it is to be found in the Saline State combined

Of Iron

Iron with Vitriolic Acid into Green Vitriol. this probably gives Rise to its Calciform Appearance when it is combined with certain Menstrua into Reddish Ochre. This is a remarkable Attraction. Iron is drawn into Metal & the Load Stone with is itself a peculiar Species of Iron Ore. many Bodies with which Iron is united conceal this Property while in its natural Condition. but if any Body be calcined with oily or fatty matters, & then applied to a Magnet, it will readily yield every particle of Iron which it contains. For the easier Calcination it will be proper to reduce the matter to Powder. —

Of Quick-Silver

It frequently found in a pure fluid state.
seldom in the saline, & never in the Calci-
-forme. It is most generally found Mine-
-ralized by Sulphur into an Ore called
native Cinnabar.

Of Bismuth

It sometimes found in its native state,
seldom in the saline, & often in the Cal-
-iforme. it is also mineralized by Sulphur
herein, & frequently by Cobalt. —

Zinc

It never found pure; frequently in a
saline State forming white Vitriol. Often
in a Calcarious when it is called Lapis
Calaminaris. The Colour of this is black

Of Zinc

white or brown. Zinc cannot be united
the
w: Sulphur, yet we sometimes find it
mineralized by other metals, the most
frequent of which is Iron. Thus mineral-
=ized it is called Sulfa Galena.

Antimony

was supposed never to have been found
pure; but a Swedish naturalist has
proved that the contrary sometimes
happens. It is never in a saline or calci-
=form state. It is most frequently found
in the state of crude Antimony, mineral-
=ized by Sulphur, & sometimes by Arsenic
When it forms a Reddish Substance.

Of Arsenic

It is never found in its native state. never
in the Calcine — in the Calciforme it pro-
-duces White Arsenic. It is often mineralized
by Sulphur. When the latter is present
in a small proportion the Ore is called
Orpiment: but when there is a great
proportion it is called Sandaracha, or Red
Arsenic. it is combined also w: Cobalt and
Arsenical Pyrites. —

Of Cobalt.

well known to Inamellers on Acc.t of
its blue Colour. is never found in a Vir-
-gin, or Calcine, but frequently in a Calci-
-forme State. — It is mineralized by Arsenic,
& Iron, by Sulphur & Arsenic & by Iron & Sulph.r:
&c

℔ Platina

Is a femimetal lately discovered, which is more ponderous even than Gold, hence being used for the Adulteration of Gold the King of Spain in whose Dominions it was found, has prohibited Exportation of it. Specimens of it therefore are very Scarce. D.r Lewis & M.r Schlosser have given us very accurate Descriptions and Chemical Histories of this Substance.

℔ Nihil.

Has been lately discovered by the Swedes, and is not very generally known. it is said to be mineralized by various Bodies, & sometimes to assume Green and blue Efflorescences which has occasioned its being

Of Nickel

was taken for Copper. —

Of Extracting metals from their Ores.

Metallic Bodies are not only in a State of Ore, but frequently are combined w: an Earthy or Stony Matrix. — When the Ore only adheres to the Matrix we may Sepe=rate it by breaking it down w: a Hammer, but when the Ore is more intimately mixed, we must powder and expose it to a stream of water. in Consequence of this Matrix which is generally Specifically lighter than the Ore is washed in Separate masses to a greater Distance. This process by the Workmen is called washing. from those different States of Union w: their

Of Extracting metals from their Ores.

Matrices. has arisen the Division of Ores
into Separable & inseparable.

Ores thus obtained have frequently
large proportions of Sulphur or Arsenic,
which under certain Degrees of Heat have
a Power to volatilize several Metals.
such Metals are distinguished by y Term
Reguline. to remove in some measure
this Inconvenience it is generally ex-
=pos'd to a Heat just sufficient to dissi-
=pate the more volatile parts Sulphur
& Arsenic, w: Process is called Roasting.
I shall not here be very minute in desc:
=ribing each Process, but refer you to
Mr Cramer's Docimastica, & make

Of Extracting Metals from their Ores

a few Remarks that may render the
Perusal of that Book more useful to you.

Having partially separated the
Metals from their Ores, we must purify
them further by the Force of Fire, and
Fusory Additions. Those Additions
may be reduced to three Heads
or
1: Such Additions as promote Fusion.
2nd: Such as absorb or precipitate any Matters
mingled with the Metallic Substances.
3d Such as prevent their Calcination,
Vitrification, & Dissipation. or: also pro:
=mote a Reduction of them when calcined.

Of the first kind are all fixt Alcalin Salts
which very much promote the Fusion of

Of Extracting Metals from their Ores.

Metals, but most powerfully of Earthy or Stony Matters. To these we may add Quick-lime, and all the Metallalis, which have this power in various degrees. Borax is the strongest Dissolvent but it is so expensive we can only employ it in small Assays. Fixed Alkalies when fused with Metals are alter-ed & with great Inconvenience, for it unites with the Sulphur or Arsenic into Alkaline Sulphurets, or Alkaline Arsenic. both of which especially the former are powerful Solvents for Metals. Quick-lime produces similar

Of Extracting Metals from their Ores.

Effects. Sandiver, or Fel vitri is often
employed for this purpose, and is a very
powerful Flux. This is a Salt drawn
& purified from melted Glass. it is com-
=pared of the Fixed Alkali & ½ common
Salt present in the Ashes w: is employed
for making Glass; ¼ w a small admixture
of Glass.

Calcanites is a powerful Flux for
¼
the Earths & Stones united w: Metals.
Calcarious & Crystalline Earths when
exposed to ~~the~~ separately to ½ most vit:
=ous heat will not undergo the least
Vitrification, but when united they
become powerful Fluxes to each other.

Of Extracting Metals from their Ores

Glass promotes the Fusion of Ores, but
acts more powerfully when united with
Metals, so that the Scoria of an Fusion
is employed as a Flux in the Assay.

The second Species of Additions for
precipitating the Bodies united with
Metals, is known to Alkalies & Earth.
= line. The Inconveniens of which I
have already mentiond. Metals may
be used for this purpose also, provided y
Metal added attracts the Sulphur or
= dere stronger than the Subject Metal.
We may always find a Metal proper
for the purpose by consulting the Table
of Elective Attractions. it will be serviable
to the Assayer and Glass w: the Assistance. —

31/-

Of Extracting Metals from their Ores.

The third Species of Additions is for promoting Calcination, Dissipation, Vitrification, and for Reducing Metals when calcined. For this purpose we may employ all unctuous & Inflammable matters. The Bit of Charcoal dropped this property in a high Degree. Calcarious Earths produces this Effect.

The Communication of Air is absolutely necessary for Calcination of Metals, so that if any Body should be interposed between Air & surface of the Metal, Calcination would probably be prevented. Hence the

Of Extraneous Imbats for their Ores.

Addition of Common Salt, or rather Glass, which readily fuses & defends the Surface of the Metal from the Air.

The Chymists have invented a Mixture which answers all the purposes of every kind of Addition, this is ye Black Flux. it is made by a gentle Deflagration of two parts of Tartar, & one of Nitre. in the fusion of Metals wth this Flux, wch Ruby serves to Assay wth the Ore of its Impure, the Fusion must be ended perfect as soon as possible, & then immediately removed from the Fire to prevent Dissipation. there are several methods by wch the purification of

Of Extracting Metals from their Ores.

The Process may be determined. if any
particles of the metal remain durbin=
=ded in the Scoria, we may conclude y:
the Fusion is not perfect; but if between
the Scoria and the Metal a light Film
be observed we may conclude y: the Heat
has been too great. -

We have already given general Direc=
=tions for Extracting Metals from their
Ores; let us now mention those which
require a particular Process. -

Gold as it is generally found in a
pure State may be extracted by Fusion=
=tion & Amalgation, but when combined
w: other Metals, it must be treated in the

Of Extracting Metals from their Ores.

general Method.

Silver When in a Virgin State must be managed like Gold, but When in a State of Ore it must be purified by Vitrification, or Cupellation w.th Lead. the Metal is not only the more disposed to Calcination & Vitrification of any, but also has a general power of calcining & Vitrifying Perfect Metal: Substances, exact Gold & Silver are which it has no Effects. we may get the Silver more from a Mixture of the Lead, or other heterogeneous Matter by Cupellation, than Vitrification, because Bodies vitrified by Lead become so very subtile in

Of Extracting Metals from their Ores

Tungsten, readily to graphitic Steel most
combust be fold.

Zinch-Silver being for the most volatile
Metal must be extracted from its Ore by
Distillation w: the Addition of Iron to fix
its Sulphur.

Zinc in the form of Sulfa Galena or Lapis
Calaminaris may be extracted by Sublim-
-mation by the Addition of Iron dried
Charcoal to prevent Calcination.

Arsenic is most conveniently extracted
in a Metalline Form, by the Addition
of double portions of alkalid Coals to
prevent Fusion. it may also be Obtained
by Distillation w: the Addition of Iron

Of the Fusibility of Metals.

to fix it to Sulphur. This Method however

is very imperfect. —

Of the Fusibility of Metals

M.S. as fixed by various Degrees of

Heat, which has occasioned this Divi-

-sion into Fusile, & Refractory. Tis

incomparably the most fusable. Next

in Order Tin, Bismuth, Lead, Zinc

Antimony, Gold, Silver, Copper, Nickel,

Iron. We have not ascertained y exact

Fusibility of the rest. it is certain how-

=ever that Platina cannot be fused

in a separate State by the Application

of any Heat. The Degree of Heat which

Of the Fusibility of Metals

Metals require for their Fusion is very
regular in each. Nó we have not been
able to determine exactly as a Thermometer
can not be conveniently employed. it is pro-
=bable that they all acquire an equal De=
=gree when they become red, so that we
shall adopt that as a standard. Tin Lead
Bismuth & Zinc all fuse in less than a
red Heat. Antimony upon the Approach
of it. Gold & Silver directly after it. Copper
Nickel & Iron require a Heat much greater
than the red: the last of these becomes
dilute & white colored before Fusion.
which has been called the White Heat of Iron.
we shall not mention the Changes pro=
=duced upon different Metals by y: Action of

Of the Fusibility of Metals

Fire, except Gold & Silver ch: remain unchanged for any Span of time, in any Degree of Heat which we have yet experienced. Lead & Tin suffer no Change when fused, but from the moment their Fusion begins, a conversion & Vitrification take place also. Hence we learn that in Cases where Fusible Metals are required in a Metallic State, they ought to be removed as far as possible from the Fire after Fusion. on the contrary from & Copper suffer Calcination & Dissipation in their progress to Fusion. if therefore they be required in a calcined State, the Heat applied must not be sufficient to fuse

Of the Fusibility of Metals.

Atom: But if we want them in a Metallic
State, the Fire must be raised as quick as
possible. The Semimetals are still more
disposed to Fusion, Calcination &c, -
Therefore they require both a sudden Ac-
-mulation of Heat, and a sudden Removal
after Fusion. Such Silver is calcined
most readily at 500: of Faren Thermom:

Having mentioned the Fusion of
Metals by Fire, we shall next consider
its Effects in Calcination.

Mercury is the most easily calcined of any
M.S. in which State it is called Precipitate
per Se. Mr Homberg affirms Mercury calcined
Mercury contains 1/100 of pure Gold. Best to

Of the Fusibility of Metals

Mercury, Lead is the most disposed to
Calcination, then Bismuth, Antimony
& Cast Iron. Tin, tho very easily fusable
cannot be calcined, but in an extreme
Degree of Heat. in Enumerating 4 Pro-
= perties of M:l: upon a general Sub:
= ject, it may be taken for granted
the Properties of such as are omitted have
not been accurately ascertained by Experi-
ments such is the case both on the Subject
of Fusion & Calcination.

The next Effect of Fire upon Metals
after Calcination is Vitrification.
Gold & Silver cannot be calcined, but
when corroded by Aid Menstruum they

Of the Vitrification of Metals

may be vitrified by Heat. Lead is most easily vitrified. next in Order are Bismuth, Antimony, and Iron. Vitrified Lead infusion is of a penetrating Nature, that is easily pervades the most compact Vessels. This is some Measure prevented by the Addition of Sand, or powdered Glass.

Having mentioned the Changes of Metallic Substances from their Metalic Form to Calces & Glasses; let us next consider the Means by which their Original Texture may be restored. This is called the Reduction of Metals. This is effected by the Addition of Salts or unctuous Inflammable

Of the Reduction of Metals.

Among the most powerful of which is
Charcoal. Chemists suppose that the
Calcin:n & vitrif:on of M: & : are occasioned
by the Separation of their Phlogiston, & y:a
sufficient Quantity being imparted to
them by the Animal or Vegitable Soul,
they again assume a Metallic form:
But to Abviate this Theory we need only
Observe, that Calcareous Earths when
heid will reduce M: & : as well as Char:
=coal or Oily Inflammables. is not the
Matter liberated first Air? —

The following Facts are Observed in
the Calcination & Reduction of Metals.

By the Reduction of Metals

that they acquire an additional weight
after Calcination, notwithstanding the
parts that are dissipated. if however this
Calx be reduced to a Metalline State, it
will be found lighter than the Mass originally
subjected to Calcination. it is very difficult to
Account for this Phænomena. Some Au:
for the former by supposing that ye Additi:
:onal weight is communicated by ye grosser
parts of the Fuel, but the Impr: ^2 denies
equally well when the M: D: is calcined
in the Focus of a Speculum, as in a Culinary
Fire. Nor can this Additional weight be
furnished by the Air as Some have thought;
for the Impr: ^2 denies as well in Vacuo. —

of the Relations of mutable to each other

All M: S: may be intimately united ex-
-cept Silver & Nihil. Iron & Lead. Mercury
& Platina. Cobalt & Nihil. add to these
Exceptions Zinc & Bismuth w: unite w: each
none. Bismuth & Nihil do not unite
alone, but if Cobalt be added a union
of the three takes place. most M: S: are
very brittle, just as they begin to con-
-crete after Fusion, by breaking therefore
& examining the internal structure we
may see when the parts of the combined M:
Substance are sufficiently blended. Other-
-wise it is very difficult to determine.

The white M: S: change the Colour of
the Atmos, more than in proportion to their

Of the Relation of Metals to Each Other.

Quantities added. Thus a small portion
of Arsenic discharges the yellow Colour of
a large Quantity of Copper.

The Combinations of Sm. S. serve for
various purposes of Art. E.g: the Gord:
-ness of Speculums depend upon ye Polish
they receive, we also know that y^e
Polish can be imprest upon that Substance
which is most brittle, and at the same time
most dense and of the closest Texture. Such
a Substance we must endeavour then to
get for a Speculum. But it also will
require to be Coated upon or corroded
by the Air. The Combination of Arsenic
& Copper has been employed for this

of the Relation of Metals &c.

purpose on acc.t of its Brittleness &
light Colour; it is however very readily
corroded and tarnished by the Air. & French
Chemists say y.t a Combination of Gold
& Zinc possesses the properties required
more perfectly than any yet invented.

Other purposes of Art require y most
sonorous Bodies possible as the making
of Bells. as Bodies become sonorous
in proportion to their Density & Elasticity,
we must therefore chuse a Compound w.ch
will possess these properties most perfectly.
Purchas Ordonnance requires a Metal
of this sort. Every Variature of Mr.

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of the Relation of Metals &c

diminishes their Malleability. a small
Quantity of Tin destroys y: Malleability
of a great proportion of Gold. y Fusibi:
of M.S: is very much encreased by Mixture.
For Example 2 parts of Tin 3 parts of Lead
& 5 of Bismuth when mingled may
be fused w: the Heat of boiling water.
Anatomists
have been extremely anx=
=ious to get a M.S: sufficiently fusible
for Injections, & by that means obtain a
perfect Model of the human Blood Vessels.
But y before mentioned Compound is unfit
for this purpose, because y: boiling Heat
which is necessary for its Fusion destroys y:
small Ramifications. & Fusibility

Of the Relation of Metals

may be sufficiently encreased by ☿ but it renders it also very brittle, so as to be intirely unfit for the purposes intended.

The Combination of ☿ with the Metals is called Amalgation. Gold. Lead. Tin, Bismuth & Zinc unite with ☿ at a boiling heat if previously dried. The Practise of Powderings only required for Gold, the rest may be united by adding them hot to the boiling Mercury. Silver & Mercury may be united if the former is suspended in dilute ♎, and the latter added in a proportion large enough to saturate the acid, & dissolve the Silver. Luna Cornea with may be formed

Of the Relation of Mutation.

by precipitating Silver from Oz w: Oz.
when united with Vol: Alkali produces
an Ammon: c: w: unites w: Oz & y Silver
may be extracted very pure from y Com:
bination.

Vnite Copper & Mercy: we must
take the former in the State of Oxygenize
dissolve it in vinegar — put y Solution
into an Iron pan w: Mercury - Apply it
to the Fire stir the Mixture w: an iron
Ladle till they are united, & then pour
off the vinegar: this may be done w:
Glass vessels by the Addition of Iron
w: attracts the Acid more strongly than
the Copper. this Compound is Susable

nearly at the boiling point of ly freq:
Repetitions of the process, the Copper
assumes the Appearance of Gold. to
unite Mercury & Antimony we must heat
them in Separate Crucibles, then put ȳ:
together, & use Fixture. The Mercury
Obtained from this mixture is very pure
& less liable than formerly to be turned
into a black powder. Bismuth unites
the
wᵗʰ Mercury, & disposes it also to unite w:
Other Mᵗˡˢ. — In all Combinations
of Mᵗˡˢ the weight of the Compound is
greater or less. & often equal to ȳ sum
of the mixed. So ȳ: the famous Proposn:
of Archimides for determining ȳ: Quantity

Of the Relation of Metals &c

of Alloy in a Metal will not be universal-
-ly true.

The Separation of M:S: from each other
may be best known from their Chemical
History and Elective Attractions. we shall
only mention here the most precious Metals.

Gold may be Separated from all M:S:
by an Amalgation w: Mercury for which
it has a stronger attraction than any
other M:S: — Gold may be Separated
from all M:S: by Antimony. for this
has a Power of Volatilizing all except
Gold. If Silver is added to a Solution of
Gold in Aqua Regia the Metal will be
suspended in a Separate State between
the Silver & Menstruum: it may be also

Of the Relation of Metals

Separated from Silver by Sulphur which unites w: the latter Body. Gold maybe Separated from Silver by Aqua Regia when we would dissolve the Gold, or by Nitrous Acid when we would dissolve the Silver. when we employ ye latter it will be necessary for a complete Solution that there sh^d^ be 3 parts of Silver to 1 of Gold. The Secret of ye Leadsmen loyd for extracting Gold & Silver is called Litharge. Silver may be separately Corrosive Sublimate; or by adding Scraps of Lead in Cupellation wch vitrifying the Fire also carries it thro the Cupel, & leaves the Silver pure. It is best Separated from

Of the Separation of Metals

Copper by Lixiviation .. Gold & Silver
cannot be separated from ye Instruments
by Caustick Alkali, but all other M^s^.
may: Nor can they be calcined in De-
flagrations wth Nitre, wch calcine all the
other M^s^. for a Separation of the baser
metals. I w^d^ recommend to y^r^ Perusal
the Directions given in Cramer's excellent
Treatise of the Ars Docimastica. As to y^e^
particular Relations of M^s^ to Pharmacy
& Medicine I shall leave it to ye Pharmac:
-ceutical Chymistry, & proceed to ye next
Class of Bodies the Salts. But before
this I shall subjoin a Table of ye Propor:
-tions of the Specific Gravities of Metallic
Compounds to ye Specific Grav: of ye Bodies before mixt.

Table.

1	2	3
☉ + ♄	☉ + ♋	☉ + ♀
☉ + ☽	☉ + ♌	☉ + ♂
☽ + ♄	☽ + ♋	☉ + ♃
☽ + ♀	☽ + ♌	♄ + ♀
☽ + ♃	☽ + ♍	♄ + ♃
♀ + ♃	♀ + ♌	♂ + ♌
♄ + ♀ + ♃	♀ + ♍	♂ + ♋
♃ + ♋	♂ + ♍	♃ + ♌
♄ + ♌	♄ + ♎	♂ + ♍
♄ + ♍	♃ + ♌	♃ + ♎
♋ + ♍	♄ + ♏	♌ + ♍
☽ + ♅	♃ + ♍	
	♄ + ♐	
	☽ + ♅	

Of Earthy Bodies

Earths are distinguished from ye other
Clapes of Bodies by the following Marks.
They are inodorid dry solid Substances.
not Soluble in water, not inflammable,
not easily fused in the Fire, & if fused do not
concrete in their Original Form, but re-
-main vitrified. This Definition compre-
-hends both Earths & Stones. —

Earths acording to Mr Pott are Absorb^t^
Crystalline Argillacious & Gypseous. but
for Reasons before given the latter are
properly Saline Bodies, & in the place of
them I would Substitute the Talky. so y^e^
Sh^d^ divide them into 4 Principal Genera.

Of Earthy Bodies

viz: Absorbent Argillaceous Crystd.

= line 2 Salky.

Mr Cronstadt has enumerated 9 kinds
of Earth 1: Calcarious, 2: Silicea, 3 Gn.
= nated 4: Argillacia, 5: Micacea 6: Fluors
7: Asbestina & Zeolites, 9: Magnesia. These
are however alex Divisible to the Divisions
we have adopted. His Calcaria are Species
of Absorbent. His Silicea & Granatea are
y Crystallina. They are fusible, but y: is
nothing to the M: P: w: which they are gene.
= 2 ally combined. We know alex y: M: Gn.
= der Crystallina Earths fusable. Gypseous
Bodies combined his Flores. Whose
Fusibility like the Gypseous depends

of Earthy Bodies

upon the Mixture of Water Earths. it is yet doubtful whether these Zeolites are a peculiar Earth or Only a Mixture. their Degradations are the same as Ours. their Micacea & Asbestina are probably Talky. their Magnesia is not very well known, but it is probably a Mixture.

Absorbent Earths

The distinguishing Properties of these are as follows. They effervesce with & are readily soluble in Acids. They are never hardened to strike fire with Steel. if powdered & mixed w. water they do not acquire Viscidity or harden in the Fire. they may be divided into 2 general Species 1st the Calcareous.

Of Absorbent Earths

properly so called, or such as by Calcination
= on are convertable into Quick lime.
2nd Magnesia Alba. 3rd Earths of Alum
or the double salt of Clay, 4th The Earth
Obtained from the Calcination of Animal,
& perhaps Vegitable substances.

I shall only treat of the first Species,
referring you for the other Species to the
Authors who have given the best Acc: of
them. thus for the Earth of Alum to Mr
Margraaf. for the Magnesia & Animal
Earths. to Dr Black's Treatise &: Physical
& Literary Essays. —

Calcarious Earths

This Species of Absorbents are of most importance of any other both in Arts and Medicine. They are found under various Appearances either in Strata or in loose Nodules dispersed among other Matters, or in a Crystalline Form and are also called Spar. in this State they are often mistaken for Concretions of the Crystalline Earths. they may be however commonly distinguished by the following marks. Spars when broken are in Rhom: = bridal Fragments, & if held to the Light the Fragments seem to be compound of such Fragm:

Calcarious Earths form Concretions of various Degrees of Purity & Firmness.

Calcarious Earths

Such are Common Chalk whose texture is Shivery, and its particles impalpable — the finest Marbles - and lastly the roughest Limestone all belong to this Sp.

This Species likewise includes the Stalactite which are very frequently to be met with in Caves incrusting various Substances, & sometimes to the Roots of plants giving occasion to the production of the famous Oolites - colla. in short the petrifactions always produce Calcarious matter, as do the Shells of all Animals, all Corals Fungi Lapides &c. may perhaps all kinds of Calcarious Earth are animal productions.

Of Calcarious Earths

Calcarious Earths appear also under vari=
=ous forms of Marle. The Shells of Animals
when they were Texture by long
time form wh: is called Testaceous Marle.
When this Earth is mixed wh: Clay it forms
the Marle distinguished by the Term Clayey.

Calcarious Earths are employed either
in a Solid State, or dissolved in Acids
for various purposes in Medicine & Arts.
I shall however Speak chiefly of its
use wh: Regard to the latter.

It is generally employed as an
Manure for Land, either combined wh: Clay
into a Marle or in the form of Testaceous

Of Calcarious Earths

Marle, or as Obtained by Calcination from Lime Stone or Marble. Chalk has been also employed w.h success. but in such places as have the Calcarious Earth in no other form but those of hard Con-
=cretes. they have been entirely depri-
=ved of its use as a Manure till a practice was introduced of reducing Limestones & Marbles to a powder by a particular Machine, in w.h State they become dissa-
=luable, and equally fit for manuring w.h the other kinds.

Having examined in w.h manner they are employed, let us next consider in w.h